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ABSTRACT

A project was conducted in Texas to establish a statewide articulated network of manufacturing engineering technology education at the community college and technical college level and to articulate that network upward with the appropriate four-year bachelor's degree programs in the state. The participants included 4 Texas State Technical College campuses and 10 community colleges, along with 4 four-year universities. The project staff conducted a series of curriculum development and articulation workshops on the campuses of the colleges. The workshops involved technical faculty and other staff members from the participating schools and resulted in a series of articulation agreements and curriculum modifications to align the programs at the different colleges. A final meeting of all participants resulted in a finalized core curriculum and a set of articulation agreements. (This document contains the articulation matrix developed during the project, a transfer degree plan, course description, and a course syllabus from each of the participating institutions.) (KC)

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TX 93CD16

A 1 + 1 (+2) HIGH-TECHNOLOGY PARTNERSHIP IN MANUFACTURING ENGINEERING TECHNOLOGY

ED 365 877

TEXAS EDUCATIONAL ARTICULATION MODEL FOR MANUFACTURING ENGINEERING TECHNOLOGY (TEAM-M)

A Carl D. Perkins funded study conducted under the direction of the Coordinating Board.

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Project Director
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CE065634

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June 1993

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TEXAS EDUCATIONAL ARTICULATION MODEL
FOR MANUFACTURING ENGINEERING TECHNOLOGY

June 30, 1993

Dear College President,

The Texas Educational Articulation Model (TEAM MANUFACTURING) consortium of 14 community and technical colleges and four universities in Texas has established an articulated program of Manufacturing Technology through an Associate of Applied Science Degree and on to a Bachelor of Science with a major in Manufacturing Engineering Technology. This will allow colleges to give students basic courses and allow the student to transfer to specialty areas with a minimum loss of credits or time obtaining an Associate Degree or on to a Bachelor's Degree.

The TEAM MANUFACTURING consortium invites every college in the state to become an active member of the consortium. The benefits to each of the colleges and to the manufacturing students in Texas will be enormous. Students will be able to start their manufacturing training at a college, and be able to transfer to a technical college for the final year of the Associate Degree, and then on to a university for their Bachelor of Science Degree.

If you are interested in joining the consortium, please review the attached materials. Then, if you feel that a number of courses at your institution meet or exceed the requirements of these materials or your institution will agree to modify courses, complete the application and return it to TSTC, Sweetwater.

The only cost to your institution would be a $100 initial fee and a $100 a year maintenance fee. These fees are to defray the cost of printed materials such as posters, brochures, etc. which will be provided to your institution.

We encourage you to consider joining this consortium for the benefit of students and colleges in the grand state of Texas.

Sincerely,

Robert Musgrove
Dean of Instruction
TEAM Chairman
Texas State Technical College
300 College Dr.
Sweetwater, TX 79556
1-800-592-8784/ext, 369

T. J. Beck
Project Director
Texas State Technical College
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TEAM MANUFACTURING Participants: Cisco Junior College; Clarendon College; San Antonio College; Weatherford College; Texas Southmost College; Laredo Junior College; Vernon Regional College; Texas State Technical Colleges in Amarillo, Harlingen, Sweetwater, and Waco; Ranger Junior College; Temple Junior College; Texas A&M University, University of Houston; Western Texas College; and Midwestern State University.

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- Texas State Technical College - Harlingen
- Texas State Technical College - Sweetwater
- Texas State Technical College - Waco
- Ranger Junior College
- Temple Junior College
- Texas A&M University
- University of Houston
- Western Texas College
- Midwestern State University

ACKNOWLEDGEMENTS

We are taking this opportunity to express our appreciation to the Texas Higher Education Coordinating Board, the Presidents and Administrative Staffs of the Consortium Colleges and Universities, and members of the TEAM-M (Texas Educational Articulation Model for Manufacturing Engineering Technology) group, whose dedication and hard work made this project a success.

We acknowledge the trust and confidence placed in us by the Texas Higher Education Coordinating Board by allowing us to direct and be a part of the 1 + 1 + (2) High-Tech Partnership in Manufacturing Engineering Technology Education. Our special thanks to Mr. Eduardo Gayton who was our working contact at the Board.

We offer our gratitude to the President, Administrative Staff, and individuals in the TEAM-M effort of the following schools without whose help and support this project could not have been completed.

Cisco Junior College	Mr. Clois E. Purvis, Dean of Instruction
Clarendon College	Mr. Kelvin Sharp, Dean of Instruction Mr. Lee Jackson
Laredo Junior College	Dr. Roger L. Worsley, President Dr. Jacinto Juarez Vice President for Instruction Mr. Jose Maria Ramon Industrial Trades Chairman
Midwestern State University	Mr. Jerry Faulk, Coordinator Associate Professor Manufacturing Engineering Technology
Ranger Junior College	Mr. Leonard Marusak Dean of Instruction
San Antonio College	Homer Hayes, Dean of Occu., Tech. & Cont. Ed. Mr. B. P. Agrawal Program Director
Temple Junior College	Mr. Frank Warren, Program Chairman Manufacturing Technology

Texas A & M University	Dr. Richard Wysk Dr. John Weese Dr. John Mayer Dr. Clint Bertrand, Professor Dept. of Engineering Tech.
Texas Southmost College	Dr. Fred Rolsten Mr. Victor Fuhro Dean of Instruction
Texas State Technical College Amarillo	Mr. Eldon Davidson Acting Dean of Instruction Mr. Paul Ackerman
Texas State Technical College Harlingen	George H. McShan Dean of Instruction Mr. Dean R. Saeger Mr. John Schlosser
Texas State Technical College Waco	Mr. George Gray
University of Houston	Dr. Bernard McIntyre, Dean Dr. Farouk Attia College of Technology
University of Texas Brownsville	Mr. Pat Wade, Chair
Vernon Regional Junior College	Mr. Wade Kirk, President Dr. Jerry Whitt, Dean
Weatherford College	Katherine C. Miller Dean of Instruction Mr. Billy Giles
Western Texas College	Ms. Bettie McQueen Dean of Instruction

TEXAS EDUCATIONAL ARTICULATION MODEL

"ONE PLUS ONE PLUS TWO TECHNICAL PROGRAMS"

INTRODUCTION

The intent of this project was the establishment of a state wide articulated network for Manufacturing Engineering Technology education at the community college/technical college level and to articulate that network upward with the appropriate four-year bachelor's degree programs in the state. All participants in the project are involved in the development of equivalent first-year courses at their respective institutions and a second year of highly technical manufacturing engineering offering Manufacturing Engineering Technology at a college.

The final products are (1) a series of curriculum revisions or additions which will create a core curriculum at the participating colleges, (2) a set of articulation agreements delineating the transfer and credit relationships between the programs, (3) upward articulation agreements between the two-year and four-year partners in the consortium, (4) a brochure describing the new training network which could be used by the colleges to attract students into the new system, and (5) a final report which can be used as a model for future statewide articulation efforts.

The participants included four TSTC campuses -- Waco, Amarillo, Sweetwater and Harlingen -- and ten community colleges -- Clarendon College, San Antonio College, Temple Junior College, Texas Southmost College, Laredo Junior College, Vernon Regional Junior College, Weatherford College, Western Texas College, Cisco Junior College, and Ranger Junior College. In addition, four four-year universities with accredited manufacturing Engineering Technology bachelor's degree programs will participate, including Midwestern State, Texas A & M, and the University of Houston.

TSTC Sweetwater has served as fiscal agent for the grant. The project staff conducted a series of curriculum development and articulation workshops on the campuses of the consortium colleges. The workshops involved technical faculty and other staff members from the participating schools and resulted in a series of articulation agreements and curriculum modifications to align the programs at the different colleges. A final meeting of all participants resulted in a finalized core curriculum and set of articulation agreements. The project staff developed a four-color brochure describing the new educational network.

A listing of some of the advanced training available in Manufacturing Engineering Technology specialties and their locations are illustrated in the graphics on the following pages. For further information please direct your inquiries to one plus one plus two director, TSTC Sweetwater, 1-800-592-8784 or AC 915-235-7345.

TEAM - M

TEXAS EDUCATIONAL ARTICULATION MODEL
MANUFACTURING ENGINEERING TECHNOLOGY

Articulation Agreement for Manufacturing Engineering Technology Courses
Between Members of the Texas Educational Articulation Model
Consortium of Post-Secondary Institutions in Texas

We the undersigned agree to accept the technical and general education courses as approved by the TEAM-M Consortium for transfer between all members of the consortium for credit toward any Manufacturing Engineering Technology degree program within the consortium.

As approved by the Texas Educational Articulation Model Consortium, the course credits, title, course description, and course syllabi are accepted and will appear in the catalog as program revisions are made and catalogs are published. Common course numbers will be developed and implemented as possible. Other courses may be transferred between participating colleges on an individual basis.

Be it resolved, that on this date, _____, we do declare and agree to enter into this articulation agreement between all members of the TEAM-M consortium to cooperate in offering technical programs providing transferability of the basic approved courses for students without loss of credit within all locations of consortium members of the state. All Southern Association criteria and the Higher Education Coordinating Board rules and regulations will apply.

_____	_____	_____
President	Dean	Chairperson

MANUFACTURING ENGINEERING TECHNOLOGY
Specialty Training Quick Reference

Consortium Member	Core Courses	TSTC-Sweetwater A.A.S. Degree	Credit toward B.S. Degree
All	Engl. Comp I	ENGL 1301	A&M, MW, UH
All	Engl. Comp II		A&M, MW, UH
All	Speech	SPCH 1311	A&M, MW, UH
All	Col. Alg	MATH 1314	A&M, MW, UH
All	Plane Trig	MATH 1316	A&M, MW, UH
All - (A,B,D)	Statistics	MATH 1314	A&M, MW, UH
C,E,F,G,H,I,J,L	Pre-Calculus	MATH 1321	UH
All - (M)	Col. Physics	PHYS 1401	M/W, UH
C,D,E,H,I,L,M	Chemistry		M/W, UH
All - (A,B,D,M)	Gen. Drft	DDT 1104	A&M, MW, UH
E,F,G,H,I,J,K,	Mech Drft	DDT 1203	A&M, UH
E,F,H,I,J	Tech Drft	DDT 1105	M/W, UH
All - (A,C,D,M)	CAD	DDT 1503	A&M, MW, UH
All	Psychology	PSYC 2301	A&M, MW, UH
All - (B,C,D,K,M)	Manuf. Circuits	MTC 2243	A&M, MW, UH
A,C,E,H,I	Ind. Wiring	ART 226	
All	Comp. Appl.	IMT 1013	UH
E,F,H,I,J	Manuf. Processes	MTC 1123	A&M, MW, UH
F,J	Metallurgy	MTC 1213	A&M, MW, UH
E	Methods Proc.	MTC 1323	M/W, UH
J	Composites Plastics	MTC 1423	A&M, MW, UH
E,F	Prod. Plan/Ctrl	MTC 2123	
C,E,F,G,H,J,L	Statics	MTC 2173	M/W, UH
E,F,H,J	Strength of Mat.	MTC 2273	M/W, UH
All - (A,G,H)	Mfg. Org./Mgt.	MIT 1104	A&M, MW, UH
E	Cost Ctrl/Est	ART 2223	M/W, UH
A,E,I,J,L	Ind. Safety	ART 111	A&M, MW, UH
A,C,E,F,H,I,J,K	Robotic Fund.	ART 211	A&M, MW, UH
E, H, I, J	Pneumatics	ART 225	A&M, MW, UH
I, J	NC/CNC	ART 234	A&M, MW, UH
A,E,H,I,J	Hydraulics	ART 231	A&M, MW, UH
H,I,J,L	Qlty. Assu.	MIT 2145	A&M, MW, UH
F,H,I,J,K	Prog. Controllers	ART 233	A&M, MW, UH
H	Metrology	MTC 1313	A&M, MW, UH

* Note: **All - (H)** would mean A thru M colleges except H *

A	Cisco Junior College	H	TSTC-Amarillo
B	Clarendon College	I	TSTC-Harlingen
C	Laredo Junior College	J	TSTC-Waco
D	Ranger Junior College	K	Vernon Regional Junior College
E	San Antonio College	L	Weatherford College
F	Temple Junior College	M	Western Texas College
G	Texas Southmost College		

Please refer to full matrix for details.

1 + 1 (+2) CONSORTIUM IN MANUFACTURING ENGINEERING TECHNOLOGY MATRIX
As of May 14, 1993

COLLEGE	COMP I ENGL 1301 LEC|LAB|CLK|CR	INTRO TO SPEECH SPCH 1311 LEC|LAB|CLK|CR	COLLEGE ALGEBRA MATH 1314 LEC|LAB|CLK|CR	PLANE TRIG. MATH 1316 LEC|LAB|CLK|CR
TSTC SWEETWATER	ENGL 104 4| 0| 48| 3	ENGL 154 4| 0| 48| 3	MATH 114 4| 0| 48| 3	MATH 124 4| 0| 48| 3
CISCO JUNIOR COLLEGE (A)	ENGLISH 113 3| 0| 48| 3	SPEECH 123 3| 0| 48| 3	MATH 1314 3| 0| 48| 3	MATH 1316 3| 0| 48| 3
CLARENDON COLLEGE (B)	ENGLISH 113 3| 0| 48| 3	SPCH 1311 3| 0| 48| 3	MATH 1314 3| 0| 48| 3	MATH 1316 3| 0| 48| 3
LAREDO JR. COLLEGE (C)	ENGL 1301 3| 0| 48| 3	SPCH 1311 3| 0| 48| 3	MATH 1314 3| 0| 48| 3	MATH 1316 3| 0| 48| 3
RANGER JUNIOR COLLEGE (D)	ENGL 101 3| 0| 48| 3	SPEECH 102 3| 0| 48| 3	MATH 103 3| 0| 48| 3	MATH 104 3| 0| 48| 3
SAN ANTONIO COLLEGE (E)	ENGL 1301 3| 0| 48| 3	SPCH 1306 3| 0| 48| 3	ETEC 1610 *SAC 1 6| 0| 96| 6	ETEC 1610 *SAC 1 6| 0| 96| 6
TEMPLE JUNIOR COLLEGE (F)	ENG 1613 3| 0| 48| 3	ENG 2633 3| 0| 48| 3	MATH 1613 3| 0| 48| 3	MATH 1316 3| 0| 48| 3
TEXAS SOUTHMOST COLL. (G)	ENG 0113 3| 0| 48| 3	SPCH 0113 3| 0| 48| 3	MATH 0113 3| 0| 48| 3	MATH 0123 3| 0| 48| 3
TSTC AMARILLO (H)	ENGL 1301 4| 0| 48| 3	SPCH 1311 4| 0| 48| 3	MATH 1314 4| 0| 48| 3	MATH 1316 4| 0| 48| 3
TSTC HARLINGEN (I)	ENGL 1301 4| 0| 48| 3	SPCH 1311 4| 0| 48| 3	MATH 1314 4| 0| 48| 3	MATH 1316 4| 0| 48| 3
TSTC WACO (J)	ENGL 104 4| 0| 48| 3	ENGL 134 4| 0| 48| 3	MATH 1314 4| 0| 48| 3	MATH 1316 4| 0| 48| 3
VERNON REG. JR COLLEGE (K)	ENGL 1301 3| 0| 48| 3	SPCH 1315 3| 0| 48| 3	MATH 1314 3| 0| 48| 3	MATH 1316 3| 0| 48| 3
WEATHERFORD COLLEGE (L)	ENGL 1301 3| 0| 48| 3	SPCH 1311 3| 0| 48| 3	MATH 1314 3| 0| 48| 3	MATH 1316 3| 0| 48| 3
WESTERN TEXAS COLLEGE (M)	ENGL 1301 3| 1| 64| 3	SPCH 1315 3| 0| 48| 3	MATH 1314 3| 1| 64| 3	MATH 1316 3| 0| 48| 3
MIDWESTERN STATE UNIV (M/W)	ENGL 1113 3| 0| 48| 3	SPCH 1133 3| 0| 48| 3	MATH 1233 3| 0| 48| 3	MATH 1433 3| 0| 48| 3
TEXAS A&M UNIV (A&M)	ENGL 103 3| 0| 45| 3	SCOM 101 3| 0| 45| 3	MATH 102 *A&M1 3| 0| 45| 3	MATH 103 *A&M1 3| 0| 45| 3
UNIV. OF HOUSTON (UH)	ENGL 1303 *UH3 3| 0| 48| 3	ITEC 3363 | | |	TMTH 1335 3| 0| 48| 3	TMTH 1336 3| 0| 48| 3

Notes:

1) Cr hours shown in this matrix are a mixture of semester and quarter hours. Refer to each individual school catalog for details.

2) CLK stands for clock or contact hours a student will have in this course.

COLLEGE	STATISTICS MATH 1314 LEC|LAB|CLK|CR	PRE-CALCULUS MATH 1321 LEC|LAB|CLK|CR	COLLEGE PHYSICS PHYS 1401 LEC|LAB|CLK|CR	GEN DRAFTING LEC|LAB|CLK|CR	MECH DRAFTING LEC|LAB|CLK|CR
TSTC SWEETWATER	MATH 144 4| 0| 48| 3	MATH 1321 4| 0| 48| 3	PHYS 105 3| 3| 72| 4	DDT 1104 2| 6| 96| 4	DDT 1203 2| 4| 72| 3
CISCO JUNIOR COLLEGE (A)	| | |	| | |	PHYSICS 114 3| 4| 112| 4	| | |	| | |
CLARENDON COLLEGE (B)	| | |	| | |	PHYS 1401 3| 3| 96| 4	| | |	| | |
LAREDO JR COLLEGE (C)	MATH 1342 3| 0| 48| 3	MATH 2412 | 0| | 4	PHYS 1401 3| 4| 112| 4	ENGR 1304 3| 2| 80| 3	| | |
RANGER JUNIOR COLLEGE (D)	| | |	| | |	PHYSICS 101 3| 4| 112| 4	| | |	| | |
SAN ANTONIO COLLEGE (E)	MATH 2419 4| 0| 64| 4	MATH 1413 4| 0| 64| 4	PHYS 1405 4| 3| 112| 3	DRFT 1301 3| 3| 96| 3	
TEMPLE JUNIOR COLLEGE (F)	MATH 2623 3| 0| 48| 3	MATH 1713 3| 0| 48| 3	PHYS 1634 3| 4| 112| 3	DDG 1313 2| 4| 112| 3	DDG 2313 2| 4| 112| 3
TEXAS SOUTHMOST COLLEGE (G)	MATH 0233 3| 0| 48| 3	MATH 0114 3| 1| 64| 4	PHYS 0111 & 0113 3| 4| 112| 4	DRFT 0154 3| 4| 112| 4	DRFT 0164 3| 4| 112| 4
TSTC AMARILLO (H)	MATH 1342 4| 0| 48| 3	MATH 1348/Anal. Geo 4| 0| 48| 3	PHYS 1401 4| 4| 96| 4	DDT 1104 2| 6| 96| 4	DDT 1203 2| 4| 72| 3
TSTC HARLINGEN (I)	MATH 1342 4| 0| 48| 3	MATH 2312 5| 0| 60| 4	PHYS 1401 4| 4| 96| 4	DDT 1104 2| 6| 96| 4	DDT 1203 2| 4| 72| 3
TSTC WACO (J)	MATH 144 4| 0| 48| 3	MATH 154 4| 0| 48| 4	PHYS 105 4| 4| 96| 4	DDT 104 2| 4| 72| 3	DDT 206 2| 6| 96| 4
VERNON REG JR COLLEGE (K)	MATH 1342 3| 0| 48|	| | |	PHYS 1401 3| 3| 96| 4	CAGR 1401 3| 2| 80| 4	CAGR 1402 3| 2| 80| 4
WEATHERFORD COLLEGE (L)	MATH 1342 3| 0| 48| 3	MATH 1348 3| 0| 48| 3	PHYS 401 3| 3| 96| 4	DRF 308 3| 3| 96| 3	DRF 309 3| 3| 96| 3
WESTERN TEXAS COLLEGE (M)	MATH 1442 3| 1| 64| 4	| | |	| | |	| | |	| | |
MIDWESTERN STATE UNIV (M/W)	STAT 3573 3| 0| 48| 3	| | |	PHYS 1144 2| 3| 80| 4	ENDR 1133 2| 4| 96| 3	ENDR 1133 *M/W1 2| 4| 96| 3
TEXAS A&M UNIV (A&M)	STAT 201 3| 0| 45| 3	| | |	| | |	ENDG 105 0| 6| 90| 2	ENDG 407 3| 0| 45| 3
UNIV OF HOUSTON (UH)	*UH2 | | |	*UH3 | | |	PHYS 1301/1101 3| 3| 96| 4	CIVT 1330 2| 4| 96| 3	MECT 2340 *UH2 2| 4| 96| 3

COLLEGE	TECH DRAFTING LEC|LAB|CLK|CR	INTRO COMPUTER AIDED DRAFTING LEC|LAB|CLK|CR	GENERAL PSYCHOLOGY Psyc 2301 LEC|LAB|CLK|CR	MANUF. CIRCUITS LEC|LAB|CLK|CR	INDUSTRIAL WIRING LEC|LAB|CLK|CR
TSTC SWEETWATER	DDT 1105 2| 7|108| 5	DDT 1503 2| 4| 72| 3	PSYC 104 3| 0| 48| 3	MTC 2243 (Man/Cir) 2| 4| 72| 3	ART 226 1| 3| 48| 2
CISCO JUNIOR COLLEGE (A)	| | |	| | |	PSY 113 3| 0| 48| 3	ELECTRONICS 104 3| 3| 96| 4	MAINT. MECH 113 1| 4| 80| 3
CLARENDON COLLEGE (B)	| | |	CIS 205 4| 3|112| 2	PSYC 2301 3| 0| 48| 3	| | |	| | |
LAREDO JR COLLEGE (C)	| | |	| | |	PSYC 2301 3| 0| 48| 3	| | |	ELTT 2440 | | | 4
RANGER JR COLLEGE (D)	| | |	| | |	PSYC 101 3| 0| 48| 3	| | |	| | |
SAN ANTONIO COLLEGE (E)	DRFT 1306 3| 3| 96| 3	DRFT 1305 3| 3| 96| 3	PSY 1301 3| 0| 48| 3	ETEC 2331 3| 0| 48| 3	ELTR 1407 4| 3| 112| 4
TEMPLE JR COLLEGE (F)	DDG 2373/GD&T 2| 4| 112| 3	DDG 1343 2| 4| 112| 3	PSYC 2613 3| 0| 48| 3	ELT 1314 3| 4| 112| 4	| | |
TEXAS SOUTHMOST COLLEGE (G)	| | |	DRFT 0144 3| 4| 112| 4	PSYC 0213 3| 0| 48| 3	ELEC 0104 3| 4| 112| 4	| | |
TSTC AMARILLO (H)	DDT 4124 2| 8| 120| 4	DDT 1503 2| 4| 72| 3	PSYC 2301 4| 0| 48| 3	MET 1013 2| 4| 72| 3	MET 1712 0| 4| 48| 2
TSTC HARLINGEN (I)	DRFT 1403 2| 4| 60| 3	DDT 1503 2| 4| 92| 3	PSYC 2301 4| 0| 48| 3	AMT 125 3| 4| 84| 4	AMT 105 4| 4| 96| 5
TSTC WACO (J)	DDT 204 2| 4| 72| 3	DDT 128 1| 4| 60| 2	PSYC 104 4| 0| 48| 3	ELT 120 3| 3| 72| 4	| | |
VERNON REG. JR COLLEGE (K)	| | |	CAGR 2405 3| 2| 80| 4	PSYC 2301 3| 0| 48| 3	| | |	| | |
WEATHERFORD COLLEGE (L)	| | |	ELE 301 2| 2| 64| 3	PSY 2301 3| 0| 48| 3	ELE 600 4| 4| 128| 6	| | |
WESTERN TEXAS COLLEGE (M)	| | |	| | |	PSY 2301 3| 0| 48| 3	| | |	| | |
MIDWESTERN STATE UNIV (M/W)	ENDR 2134 2| 4| 96| 4	ENDR 2134 2| 4| 96| 4	PSYC 1103 3| 0| 48| 3	*M/W2 | | |	*TE | | | 1 1/3
TEXAS A&M UNIV (A&M)	| | |	ENDG 407 3| 0| 45| 3	PSYC 107 2| 3| 75| 3	ENTC 330* A&M 4 3| 2| 75| 4	| | |
UNIV OF HOUSTON (UH)	*UH3 | | |	TECH 3324 2| 3| 80| 3	*UH1 | | |	ELET 2307 3| 0| 48| 3	| | |

COLLEGE	INTRO COMP APPL COSC 1406 LEC|LAB|CLK|CR	MFG PROCESSES LEC|LAB|CLK|CR	METALLURGY LEC|LAB|CLK|CR	METHODS PROC LEC|LAB|CLK|CR	COMP PLASTICS LEC|LAB|CLK|CR
TSTC SWEETWATER	IMT 1013 2| 4| 72| 3	MTC 1123 2| 3| 60| 3	MTC 1213 2| 3| 60| 3	MTC 1323 2| 3| 60| 3	MTC 1423 2| 3| 60| 3
CISCO JR COLLEGE (A)	CSI 153 2| 2| | 3	| | |	| | |	| | |	| | |
CLARENDON COLLEGE (B)	CIS 205 3| 2| 80| 4	| | |	| | |	| | |	| | |
LAREDO JR COLLEGE (C)	CISY 1475 3| 3| | 4	| | |	| | |	| | |	| | |
RANGER JR COLLEGE (D)	CIS 101 3| 3| 96| 3	| | |	| | |	| | |	| | |
SAN ANTONIO COLLEGE (E)	ETEC 1322 3| 0| 48| 3	ETEC 2444 3| 3| 96| 4	| | |	ETEC 1440 3| 3| 96| 4	| | |
TEMPLE JR COLLEGE (F)	CIS 1393 (DDG 2323) 3| 2| 80| 2	M/T 1313 2| 2| 64| 3	M/T 1333 2| 2| 64| 3	| | |	| | |
TEXAS SOUTHMOST COLLEGE (G)	CIS 0114 3| 2| 80| 4	| | |	| | |	| | |	| | |
TSTC AMARILLO (H)	IMT 1013 2| 4| 72| 3	MGT 8003 0| 6| 72| 3	| | |	| | |	| | |
TSTC HARLINGEN (I)	IMT 1013 2| 4| 72| 3	AMT 350 2| 3| 60| 3	| | |	| | |	| | |
TSTC WACO (J)	IMT 2060 0| 6| 72| 3	MET 301 3| 3| 72| 4	MET 112 3| 2| 60| 3	| | |	MET 201 3| 3| 72| 4
VERNON REG JR COLLEGE (K)	COSC 1301 2| 2| 64| 3	| | |	| | |	| | |	| | |
WEATHERFORD COLLEGE (L)	CIS 1307 3| 3| 96| 3	| | |	| | |	| | |	| | |
WESTERN TEXAS COLLEGE (M)	CS 1306 3| 3| 96| 3	| | |	| | |	| | |	| | |
MIDWESTERN STATE UNIV (M/W)	| | |	ENDR 1123 *M/W2 2| 3| 80| 3	MENT 3134 *M/W2 2| 4| 96| 4	*M/W2 | | |	MENT 1143 *M/W2 2| 3| 80| 3
TEXAS A&M UNIV (A&M)	| | |	ENTC 181 2| 3| 75| 3	ENTC 207 2| 3| 75| 3	| | |	ENTC 281 2| 3| 75| 3
UNIV OF HOUSTON (UH)	TECH 1300 3| 0| 48| 3	*UH 5	*UH 3	*UH 3 | | |	*UH6 | | |

COLLEGE	PROD PLAN & CTRL EC|LAB|CLK|CR	STATICS LEC|LAB|CLK|CR	MFG ORG. & MGT. LEC|LAB|CLK|CR	COST CONTROL & ESTIMATING LEC|LAB|CLK|CR	STRENGTH OF MATERIALS LEC|LAB|CLK|CR
TSTC SWEETWATER	MTC 2123 2| 3| 60| 3	MTC 2173 3| 3| 72| 4	MIT 1104 3| 3| 72| 4	MTC 2223 2| 3| 60| 3	MTC 2273 2| 4| 72| 3
CISCO JR COLLEGE (A)	| | |	| | |	| | |	| | |	| | |
CLARENDON COLLEGE (B)	| | |	| | |	BUSI 1301 3| 0| 48| 3	| | |	| | |
LAREDO JR COLLEGE (C)	| | |	ME 301 | | | 3	| | |	| | |	| | |
RANGER JR COLLEGE (D)	| | |	| | |	BUSINESS 112 3| 0| 48| 3	| | |	| | |
SAN ANTONIO COLLEGE (E)	ETEC 2350 3| 0| 48| 3	ETEC 1321 3| 0| 48| 3	MGT 1301/MGT 2310 3| 0| 48| 3 3| 0| 48| 3	ETEC 2350 3| 0| 48| 3	ETEC 2332 3| 0| 48| 3
TEMPLE JR COLLEGE (F)	M/T 2373 2| 2| 64| 3		MGT 1323 3| 0| 48| 3	| | |	
TEXAS SOUTHMOST COLLEGE (G)	| | |	ENGR 0213 3| 0| 48| 3	| | |	| | |	| | |
TSTC AMARILLO (H)	| | |	DDT 3023 2| 4| 72| 3	| | |	| | |	DDT 3523 2| 4| 72| 3
TSTC HARLINGEN (I)	| | |	| | |	GT 230 3| 0| 36| 3	| | |	| | |
TSTC WACO (J)	| | |	MET 206 3| 3| 72| 4	MET 306 2| 2| 48| 3	| | |	MET 312 3| 3| 72| 4
VERNON REG JR COLLEGE (K)	| | |	| | |	MGMT 2328 3| 0| 48|	| | |	| | |
WEATHERFORD COLLEGE (L)	| | |	ENR 2301 3| 0| 48| 3	BUS 374 3| 0| 48| 3	| | |	| | |
WESTERN TEXAS COLLEGE (M)	| | |	| | |	MGT 132 3| 0| 48| 3	| | |	| | |
MIDWESTERN STATE UNIV (M/W)	*TE | | |	MENT 3103 1| 4| 83| 3	*M/W3 | | |	MENT 3333 *M/W3 3| 0| 48| 3	MENT 4103 3| 0| 48| 3
TEXAS A&M UNIV (A&M)	| | |	| | |	ENTC 429 3| 0| 45| 3	| | |	| | |
UNIV OF HOUSTON (UH)	*UH 2 | | |	MECT 2354 3| 0| 48| 3	ITEC 3340 | | |	*UH 2 | | |	MECT 3155/3355 3| 3| 96| 4

COLLEGE	IND SAFETY LEC|LAB|CLK|CR	ROBOTIC FUNDAMENTALS LEC|LAB|CLK|CR	PNEUMATICS LEC|LAB|CLK|CR	HYDRAULICS LEC|LAB|CLK|CR	QUALITY. ASSURANCE LEC|LAB|CLK|CR
TSTC SWEETWATER	ART 111 1| 1| 24| 1	ART 211 2| 3| 60| 3	ART 225 3| 3| 72| 4	ART 231 2| 6| 96| 4	ART 232/MIT 2145 2| 3| 60| 3
CISCO JR COLLEGE (A)	MAME 123 1| 4| | 3	Electronics 234 2| 4| 96| 4	| | |	MAME 253 2| 2| 64| 3	| | |
CLARENDON COLLEGE (B)	| | |	| | |	| | |	| | |	| | |
LAREDO JR COLLEGE (C)	| | |	ETEC 2372 2| 4| | 3	| | |	| | |	| | |
RANGER JR COLLEGE (D)	| | |	| | |	| | |	| | |	| | |
SAN ANTONIO COLLEGE (E)	SET 1310 3| 0| 48| 3	ELTR 3| 3| 96| 4	ETEC 2334 3| 0| 48| 3	ETEC 2334 3| 0| 48| 3	| | |
TEMPLE JR COLLEGE (F)	| | |	M/T 2333 2| 12| 64| 3	| | |	| | |	| | |
TEXAS SOUTHMOST COLLEGE (G)	| | |	| | |	| | |	| | |	| | |
TSTC AMARILLO (H)	| | |	MET 3213 0| 6| 72| 3	MET 3113 0| 6| 72| 3	MET 1813 0| 6| 72| 3	MTR 4023 0| 6| 72 | 3
TSTC HARLINGEN (I)	BCT 302 | | |	AMT 320 4| 4| 92| 5	INT 204 2| 3| 60| 3	AMT 245 3| 4| 84| 4	AMT 370 2| 3| 60| 3
TSTC WACO (J)	OSH 216 2| 5| 60| 3	MET 322 9| 3| 144| 6	PHY 115 3| 3| 72| 4	PHY 114 3| 3| 72| 4	MET 324 2| 3| 60| 3
VERNON REG JR COLLEGE (K)	| | |	ELTE 2356 1| 5| 96| 3	| | |	| | |	| | |
WEATHERFORD COLLEGE (L)	MGT 303 3| 0| 48|	| | |	| | |	| | |	MGT 302 3| 0| 48| 3
WESTERN TEXAS COLLEGE (M)	| | |	| | |	| | |	| | |	| | |
MIDWESTERN STATE UNIV (M/W)	*TE | | |	MENT 4403 2| 2| 64| 3	MENT 2334 2| 4| 96| 4	MENT 2343 1| 4| 80| 3	*TE | | | 2
TEXAS A&M UNIV (A&M)	TECH EL 3| 0| 45| 3	ENTC 410 2| 3| 75| 3	ENTC 303 * A&M 2 2| 3|75|3	ENTC 303 *A&M 2 2| 3| 75| 3	ENTC 320 *A&M 3 2| 3| 75| 3
UNIV OF HOUSTON (UH)	*UH 2 | | |	*UH 2	*UT4 | | |	MECT 3318/3118 *UT4 3| 3| 96| 4	MECT 3367 3| 0| 48| 3

COLLEGE	PROGRAMMABLE CONTROLLERS LEC|LAB|CLK|CR	METROLOGY/ MEASUREMENTS LEC|LAB|CLK|CR	CHEMISTRY CHEM 1411	ELECTIVE LEC|LAB|CLK|CR	LEC|LAB|CLK|CR
TSTC SWEETWATER	ART 233 2| 4| 72| 3	MTC 1313 2| 3| 60| 3	| | |	ART 234 NC/CNC 2| 3| 60| 3	| | |
CISCO JUNIOR COLLEGE ( )	| | |	| | |	| | |	| | |	| | |
CLARENDON COLLEGE ( )	| | |	| | |	| | |	| | |	| | |
LAREDO JR COLLEGE ( )	| | |	| | |	CHEM 1411 3| 4 | |4	| | |	| | |
RANGER JR COLLEGE ( )	| | |	| | |	CHEM 103 2| 4 |102|3	| | |	| | |
SAN ANTONIO COLLEGE ( )	| | |	| | |	CHEM 1401 3| 3 | 96|4	| | |	| | |
TEMPLE JR COLLEGE (F)	M/T 2353 2| 2| 64| 3	| | |	| | |	| | |	| | |
TEXAS SOUTHMOST COLLEGE ( )	| | |	| | |	| | |	| | |	| | |
TSTC AMARILLO (H)	MET 3613 0| 6| 72| 3	MTR 3013 2| 4| 72| 3	CHT 1005 3| 6 |108 |5	| | |	| | |
TSTC HARLINGEN (I)	AMT 345 3| 4| 84| 4	| | |	CHEM 1411 4| 4 | 96|4	MGT 2303 2| 4| 72| 3	| | |
TSTC WACO (J)	MET 322 9| 3| 144| 6	| | |	| | |	MET 205 3| 3| 72| 4	| | |
VERNON REG JR COLLEGE (K)	ELTE 2357 1| 5| 96| 3	| | |	| | |	| | |	| | |
WEATHERFORD COLLEGE ( )	| | |	| | |	CHEM 401 3| 3 |96 |4	| | |	| | |
WESTERN TEXAS COLLEGE ( )	| | |	| | |	CHEM 1411 | | |	| | |	| | |
MIDWESTERN STATE UNIV (M/W)	MENT 4403 | | |	*M/W2 | | |	CHEM 1411/1143 | | |	*TE | | |	| | |
TEXAS A & M UNIV (A&M)	ENTC 330 *A&M 4 2| 3| 75| 3	*A&M 3 | | |	| | |	ENTC 380 2| 3| 75| 3	| | |
UNIV OF HOUSTON (UH)	ELET 3316 *UH 2 2| 3| 80| 3	*UH 5 | | |	CHEM 1331/1111 | | |	*UH 2 | | |	| | |

*UH1	Counts toward a Social Science
*UH2	University of Houston will accept as elective (up to 9 credit hours)
*UH3	Is a prerequisite
*UH4	Both ART 225 & 231 required for credit toward MECT 3318/3118
*UH5	Both MTC 1123 & MTC 1313 required for credit toward MECT 1364 (LEC & LAB)
*UH6	Both MTC 1213 & MTC 1423 required for credit toward MECT 4172/4372
*M/W1	DDT 1104, 1203, 1105, & 1503 required for ENDR 1133 & 2134. Total credit of 7 hrs.
*M/W2	MTC 1123, 1213, 1313, 1423, 2243 required for ENDR 1123, MENT 1143 & 3134. Total credit of 10 hrs.
*M/W3	MIT 1104 & MTC 223 required for MENT 3333 credit of 3 hrs.
*TE	Technical Electives. Six credit hrs. with all.
*A&M1	A&M will give credit for MATH 150 if both MATH 1314 and MATH 1316 have been taken
&M2	A&M will give credit for ENTC 303 if both ART 225 & ART 231 have been taken
*A&M3	A&M will give credit for ENTC 320 if ART 232 or MIT 2145 have been taken and MTC 1313 has also been taken
*A&M4	A&M will give credit for ENTC 330 if both MTC 2243 and ART 233 have been taken
*SAC1	San Antonio College offers a six semester hours Engineering Math course

TEAM MANUFACTURING
Transfer Degree Plan

Degree: _____

Transfer from: _____ College

Student: _____ SSN: _____

Courses needed at: _____ College

Subject	Title Accepted	Grade	Grade Taken	Program Chair Initials
COMP I				
INTRO TO SPEECH				
COLLEGE ALGEBRA				
PLANE TRIG				
STATISTICS				
PRE-CALCULUS				
COLLEGE PHYSICS				
GEN DRAFTING				
MECH DRAFTING				
TECH DRAFTING				
INTRO COMPUTER AIDED DRAFTING				
GENERAL PSYCHOLOGY				
MANUF CIRCUITS				
INDUSTRIAL WIRING				
INTRO COMP APPL				
MFG PROCESSES				
METALLURGY				
METHODS PROC				
COMP PLASTICS				
PROD PLAN & CTRL				
STATICS				
MFG ORG & MGT				
COST CONTROL & ESTIMATING				
STRENGTH OF MATERIALS				
IND SAFETY				
ROBOTIC FUNDAMENTALS				
PNEUMATICS				

HYDRAULICS				
QUALITY ASSURANCE				
PROGRAMMABLE CONTROLLERS				
METROLOGY/MEASUREMENTS				
CHEMISTRY				
ELECTIVE				

TEAM MANUFACTURING
TRANSFER DEGREE PLAN

Degree: _____

Subject	Grade	Date Taken	Program Chair Initials

* Not an official transcript - For TEAM-M usage only*
** Additional Page for your convenience**

TEAM-M PROJECT 1 + 1 (+2)
MANUFACTURING COURSES

CREDITS

COMPOSITION I 3
Principles and techniques of written composition, textual analysis, and critical thinking.

INTRODUCTION TO SPEECH 3
Theories and practice of speech communication behavior in interpersonal, small groups, and public communications situations.

COLLEGE ALGEBRA 3
A further study of quadratics; polynomial, rational, logarithmic and exponential functions; systems of equations; progressions; sequences and series; and matrices and determinants.

PLANE TRIGONOMETRY 3
Topics in trigonometric functions, right triangles, trigonometric identities, radian measure, graphs of periodic functions, and oblique triangles.

STATISTICS 3
Presentation and interpretation of data, probability, and sampling. Correlation and regression, analysis of variance, and uses of statistical software.

PRE-CALCULUS MATH 3
Applications of algebra and trigonometry to the study of elementary functions and their graphs, including polynomial, rational, exponential, logarithmic and trigonometric functions; may include topics from analytical geometry.

COLLEGE PHYSICS 4
Principles and application of mechanics, wave motion, and heat with emphasis on fundamental concepts, problem solving, notation and units.

GENERAL DRAFTING 4
An introductory course to the basic qualification requirements for the entry level drafter. The student will use basic drafting instruments, tools, and equipment. Emphasis will also be placed on freehand lettering and sketching techniques.

MECHANICAL DRAFTING 3
An intermediate course covering working detail drawings with proper dimensioning and tolerances. Also included will be the use of sectioning techniques, common fasteners, isometrics or obliques in the preparation of assembly drawings with bill of material.

TECHNICAL DRAFTING 5
The student will apply the basic and general drafting techniques learned to more advanced technical drawings as related to manufacturing and machine shop problems. Techniques of lettering, sketching, dimensioning and inking will be reviewed. The student will learn machine

drawing standards, safety codes, assembly details of machine parts, screws, fasteners, welds, threads, gears, cams, splices, dimensioning sheetmetal layouts, tolerances and working drawings for parts to be manufactured to close tolerances.

INTRODUCTION TO COMPUTER AIDED DRAFTING 3

This is the introductory course to computer aided drafting and it is emphasized as a tool to provide quick access to data, produce working drawings for all disciplines and to save and store drawings for future reference, revision and modification on software and printouts.

GENERAL PSYCHOLOGY 3

A survey of the major topics in psychology. Introduces the study of behavior and the factors that determine and affect behavior.

MANUFACTURING CIRCUITS 3

An in-depth study of electricity in manufacturing, including power generation, transmission, circuits, capacitors, coils, AC & DC circuits, Kirchoff's laws, Thevinin's Theorem, motor and machine control circuits, and troubleshooting.

INDUSTRIAL WIRING 2

A study of the requirements specified by the National Electrical Code as minimum requirements for an approved electrical installation which includes all aspects from the standpoint of safety for personnel and equipment.

INTRODUCTION TO COMPUTER APPLICATIONS 3

This course is an introduction to microcomputer operations and the use of application software, including word processing, electronic spreadsheets, and relational databases.

MANUFACTURING PROCESSES 3

An in-depth study of foundry process, special casting, hot and cold working, forming, machining, finishers and welding processes.

FUNDAMENTALS OF METALLURGY 3

A comprehensive study of the refining, mechanical and physical properties of ferrous and nonferrous materials. The theory of alloys, heat treatment and testing will be included.

METHODS PROCESSING 3

A practical experience in the processing and time evaluation for manufacturing and assembly of components. Purchasing will be included.

COMPOSITES/PLASTICS 3

A study of the fabrication processes, the materials, modeling, curing, casting and machining of metal and resin matrix systems products.

PRODUCTION PLANNING & CONTROL 3

A study of the objectives, applications and functions of the manufacturing organizational environment through planning and scheduling analysis.

STATICS 4

Composition and resolution of forces. Equilibrium of forces acting on structures and machines. Friction, moments, couples, centroids, moments of inertia, and section modulus.

MANUFACTURING ORGANIZATION & MANAGEMENT 3

A study of manufacturing management, organization, productivity, systems design and facilities as well as relationships in the industrial environment.

COST CONTROL & ESTIMATING 3

A practical study of the elements of profit-planning data and applying direct-cost-machine-hour rate systems.

STRENGTH OF MATERIALS 3

Relationships between loads placed on structural components, mechanical properties of materials used in the components, shape and size of components, resultant stresses in components, and component deflections. Selection of loads, component size and shape, or particular alloys for given applications.

INDUSTRIAL SAFETY 1

This course is structured to create an awareness of the many safety hazards present within the industrial environment. History and growth of OSHA, human behavior, personal protection, electrical, machine and robotic safety will be studied.

ROBOTIC FUNDAMENTALS 3

This course is an introduction to state-of-the-art flexible automation. It is intended for the student who will install, repair, maintain or develop robotic flexible manufacturing systems.

PNEUMATICS 4

This course is designed to give a complete overview of pneumatic formulas, principles, functions and circuits. Hands-on experience will relate to industrial automated systems.

HYDRAULICS 6

A study of the fundamentals of fluid power. The application, function, construction and operation will include pumps, motors, cylinders, valves and components. Installation and maintenance will be stressed.

QUALITY ASSURANCE 3

This course is the study of measurements, inspection, statistical process control and their application to automated manufacturing systems.

PROGRAMMABLE CONTROLLERS 3

This course is a study in programmable controllers that include processor units, numbering systems, memory organization, relay-type devices, timers, counters and data manipulators.

METROLOGY/MEASUREMENT 3

This course is a comprehensive study of the terminology, methodology and practice of measurement systems and equipment.

TSTI SWEETWATER

Texas State Technical Institute
Instructional Support

COURSE SYLLABUS

TITLE STATISTICAL PROCESS CONTROL

NUMBER MIT 2145

LEC 3 LAB 4 CREDIT 5

PREREQUISITE: None

PREPARED BY: Jerry Frederick

APPROVED BY: Jerry Frederick

DATE: November, 1991

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY:	DATE:
Bill Barnes	12/16/91
Jerry Frederick	9/4/92

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Texas State Technical Institute

COURSE SYLLABUS

I. COURSE DESCRIPTION (Catalog Description)

This course covers the following components of statistics which include techniques of collection, presentation, analysis and interpretation of numerical data as applied to statistical process control. Stresses application of correlation methods, analysis of variance, dispersion, sampling quality control, reliability, mathematical modes and programming.

II. COURSE OBJECTIVE (The Terminal Objective of the Course)

This course provides an introduction to statistical process control including the philosophy and mechanisms needed to establish, monitor, and control an SPC program. Upon completion of the course, the student will have the knowledge and skill to identify and solve quality problems and prepare and analyze control charts related to quality and prccess improvement.

III. COURSE OUTLINE

A. CONTENT - UNITS

1.0 Orientation and Introduction
- 1.1 Introduction to Statistical Process Control
- 1.2 Philosophy of SPC
- 1.3 Quality and Productivity
- 1.4 Process Orientation
- 1.5 The Entire Process
- 1.6 Expectations

2.0 Problem Analysis and Solution
- 2.1 Identifying Problems
- 2.2 Pareto Analysis
- 2.3 Cause and Effect Analysis
- 2.4 Group Problem Solving

3.0 Measurements
- 3.1 Variability
- 3.2 Basic Measurement Statistics

4.0 Charting
- 4.1 Introduction to Control Charts
- 4.2 Control Charts for Variables
- 4.3 Control Charts for Individuals
- 4.4 Control Charts for Attributes
- 4.5 Interpreting Control Charts

5.0 Implementation
- 5.1 Process Capability
- 5.2 Implementing the Philosophy

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

1.0 The objective of this unit is introduce Statistical Process Control, Statistical Quality Control, the philosophy of continuous improvement, to define the SPC process, explain the relationship between processes and to identify what should be measured and how to measure it. Upon completion of this unit, student will have sufficient knowledge to:

- 1.1 Define and discuss the concept of Statistical Process Control and the importance of continuous quality improvement.
- 1.2 Outline the philosophy and identify potential pitfalls of establishing an SPC program.
- 1.3 Establish and defend the relationship between quality improvement and productivity.
- 1.4 Discuss the orientation of the processes and identify the inputs, the transformation process and the output of each process.
- 1.5 Illustrate a basic model of the process and define the feedback loop.
- 1.6 Identify what should be measured in the process and discuss how the measurements should be taken and recorded.

2.0 The objective of this unit is to provide techniques for problem identification, introduce Pareto Charts and Pareto Analysis, methods of data collection, and the use of improvement teams. At the conclusion of this unit, the student will have sufficient training and knowledge to:

- 2.1 Prepare check sheets and gather data to document the existence of a problem.
- 2.2 Construct Pareto Charts from the data gathered and to analyze those charts to identify potential improvement areas.
- 2.3 Determine cause and effect from data gathered about the process characteristics.
- 2.4 Establish process improvement team and discuss the advantages and disadvantages of group problem solving.

3.0 The objective of this unit is to define process variation and to establish the basic measurement statistics needed to measure variations. Upon completion of this unit, the student will have sufficient knowledge to:

- 3.1 Identify process variations and determine if that variation is normal or abnormal.
- 3.2 Prepare histograms, construct distribution curves and to determine standard deviation.

4.0 The objective of this unit is to provide techniques for preparing and analyzing control charts used in process improvement. At the conclusion of this unit, the student will have adequate training to:

4.1 Determine sampling requirements and devise sampling schemes to adequately measure specific process characteristics.

4.2 Construct control charts and calculate upper and lower control limits as they specifically relate to variables.

4.3 Construct control charts and calculate upper and lower control limits as they specifically apply to individual data samples.

4.4 Construct control charts and calculate upper and lower control limits as they specifically apply to attribute data.

4.5 Interpret these control charts to determine stability of the processes and to identify unusual process behavior.

5.0 The objective of this unit is to provide information relative to process capability and methodology for implementation of a Statistical Process Control program. At the conclusion of this unit, student will have sufficient knowledge and understanding to:

5.1 Perform process capability calculations and to plot the process capability index.

5.2 Outline the process, mission statements, commitment demonstration, and organizational steps necessary to implement Statistical Process Control.

IV. REFERENCE MATERIAL

Quality Improvement Using Statistical Process Control
Lawrence S. Aft, Harcourt Brace Jovanovich, Publishers

V. SUPPLIES

Loose Leaf Notebook
Paper
Spiral Notebook
Pens
Pencils
5 1/4" Floppy Disk

VI. GRADING PROCEDURE

90 - 100 = A
80 - 89 = B
70 - 79 = C
60 - 69 = D
0 - 59 = F

Chapter Tests	50%
Lab Assignments	25%
Final Exam	25%

VII. ATTENDANCE POLICY

Students are required to attend class punctually and regularly. An absence will be assessed each time a student is not in attendance during a regularly scheduled period of instruction. Students will be assessed an absence for each three tardies.

A student is considered excessively absent when:

1. Absent from three consecutive periods of instruction.
2. Total absences equal eight.
3. In the judgement of the instructor, the student is not making satisfactory progress due to absences from class.

The first day following the period in which a student becomes excessively absent, an excessive absence report will be filed on the student in the Student Services Offices. The student will not be readmitted to class without an interview with the counselor and presentation of a signed statement agreeing to the terms for readmittance. If these terms are not met, the student may be dropped from the course. The excessive absence report becomes a part of the students permanent file.

A period of instruction is one or more continuously scheduled hours of lecture or lab instruction for a course. Early departure from a period of instruction will be treated the same as a tardy.

TSTI SWEETWATER

Texas State Technical Institute
Instructional Support

COURSE SYLLABUS

TITLE GENERAL DRAFTING I

NUMBER DDT 1104

LEC 2 LAB 6 CREDIT 4

PREREQUISITE: NONE

PREPARED BY: Ronnie Blair

APPROVED BY: [signature]

DATE: 12-20-90

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: [signature] DATE: [illegible]

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Texas State Technical Institute

COURSE SYLLABUS

I. COURSE DESCRIPTION (CATALOG DESCRIPTION)

An introductory course to the basic drafting instruments, tools, and equipment. Emphasis will also be placed on freehand lettering and sketching techniques. The student will learn the various choices of disciplines and career fields in drafting.

II. COURSE OBJECTIVE (THE TERMINAL OBJECTIVE OF THE COURSE)

Upon completion of the course, students will be able to understand the fundamentals of drafting and develop the necessary drafting skill to apply them to various drafting problems.

TSTI SWEETWATER

Texas State Technical Institute

COURSE SYLLABUS

III. COURSE OUTLINE

A: CONTENT

I. FUNDAMENTALS
II. LETTERING
III. GEOMETRIC CONSTRUCTION
IV. MULTIVIEW DRAWING
V. SECTION VIEWS
VI. AUXILIARY VIEWS
VII. DESCRIPTIVE GEOMETRY
VIII. DIMENSIONS

TSTI SWEETWATER

Texas State Technical Institute

COURSE SYLLABUS

III. COURSE OUTLINE

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

The student will:

1. become familiar with basic drafting instruments and their uses
2. be able to do freehand lettering neatly and legibly
3. learn the procedures used in geometric construction
4. be able to draw one, two, and three-view drawings
5. be able to draw different types of section drawings
6. be able to draw auxiliary views
7. be able to draw the proper steps used in descriptive geometry
8. attain the knowledge and skill to dimension properly

TSTI SWEETWATER

Texas State Technical Institute

COURSE SYLLABUS

IV. REFERENCE MATERIAL

WORKBOOK FOR TECHNICAL DRAWING, by John A. Nelson

V. SUPPLIES

paper
pencil

TSTI SWEETWATER

Texas State Technical Institute

COURSE SYLLABUS

VI. GRADING PROCEDURE

Notebook	80%
Professionalism	10%
Final Exam	10%

VII. ATTENDANCE POLICY

see attached sheet

Attendance policy

It is the policy of TSTI-Sweetwater to require students to attend classes punctually and regularly so that learning objectives of the course can be accomplished. An absence is assessed each time a student is not in attendance during a regularly scheduled period of instruction. The assessment does not depend on the cause for absence, and it applies to both instructional and laboratory sessions. In each quarter, the assessment of absences begins the first day after the student officially enrolls in the class. Each instructor will notify students of the attendance policy and procedures on the first day of class. Every effort on the part of the instructor will be made to enable students to make up missed work. However, it is the student's responsibility to make arrangements with the instructor to complete the work.

A student is considered excessively absent from a course when:

1. Absent from three consecutive periods of instruction after the date enrolled, or
2. Total absences equal the number of periods of instruction scheduled in two calendar weeks, or
3. In the judgment of the instructor, the student is not making satisfactory progress due to absence from class and it is not feasible for the student to make up the missed work.

The first day following the period in which a student became excessively absent, an excessive absence report is filed on the student in the Student Services Office. The student will not be readmitted to class without an interview with the counselor and a signed statement agreeing to the terms for readmittance. If the terms for readmittance are not met, the student may be dropped from the course. The excessive absence report becomes a part of the student's permanent file.

TSTI SWEETWATER

Texas State Technical Institute
Instructional Support

COURSE SYLLABUS

TITLE MECHANICAL DRAFTING

NUMBER DDT 1203

LEC 2 LAB 4 CREDIT 3

PREREQUISITE: DDT 1104

PREPARED BY: Ronnie Blair

APPROVED BY: Mich Cle

DATE: 12-20-90

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: _____ DATE: _____

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COURSE SYLLABUS

I. COURSE DESCRIPTION (CATALOG DESCRIPTION)

An intermediate course covering working detail drawings with proper dimensioning and tolerances. Also included will be the use of sectioning techniques, common fasteners, isometrics or obliques in the preparation of assembly drawing with bill of materials.

II. COURSE OBJECTIVE (THE TERMINAL OBJECTIVE OF THE COURSE)

Upon completion of the course, students will be able to draw detail drawings with proper dimensioning and tolerances.

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COURSE SYLLABUS

III. COURSE OUTLINE

A: CONTENT

I. GEOMETRIC CONSTRUCTION
II. MULTIVIEW
III. SECTION
IV. AUXILIARY
V. DESCRIPTIVE GEOMETRY
VI. DIMENSIONS
VII. ISOMETRICS

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COURSE SYLLABUS

III. COURSE OUTLINE

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

The student will:

1. Have a basic understanding of the procedures of geometric contruction.
2. Be able to project and develop multiview drawings.
3. Understand the different types of sectional views.
4. Understand the functions of auxiliary views.
5. Be able to constuct the basic steps of descriptive drawings.
6. Dimension most basic drawings.
7. Understand how isometric drawings are done.

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COURSE SYLLABUS

IV. REFERENCE MATERIAL

TECHNICAL DRAWING, by David L. Goetsch

V. SUPPLIES

paper

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Texas State Technical Institute
Instructional Support

COURSE SYLLABUS

TITLE MANUFACTURING PROCESSES

NUMBER MTC 1123

LEC 2 LAB 3 CREDIT 3

PREREQUISITE: NONE

PREPARED BY: THOMAS BECK

APPROVED BY:

DATE:

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: Bill Barnes DATE: 1-02-90

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COURSE SYLLABUS

VI. GRADING PROCEDURE

Answer questions	10%
Drawings	70%
Professionalism	10%
Final Test	10%

VII. ATTENDANCE POLICY

see attached sheet

Attendance policy

It is the policy of TSTI-Sweetwater to require students to attend classes punctually and regularly so that learning objectives of the course can be accomplished. An absence is assessed each time a student is not in attendance during a regularly scheduled period of instruction. The assessment does not depend on the cause for absence, and it applies to both instructional and laboratory sessions. In each quarter, the assessment of absences begins the first day after the student officially enrolls in the class. Each instructor will notify students of the attendance policy and procedures on the first day of class. Every effort on the part of the instructor will be made to enable students to make up missed work. However, it is the student's responsibility to make arrangements with the instructor to complete the work.

A student is considered excessively absent from a course when:

1. Absent from three consecutive periods of instruction after the date enrolled, or
2. Total absences equal the number of periods of instruction scheduled in two calendar weeks, or
3. In the judgment of the instructor, the student is not making satisfactory progress due to absence from class and it is not feasible for the student to make up the missed work.

The first day following the period in which a student became excessively absent, an excessive absence report is filed on the student in the Student Services Office. The student will not be readmitted to class without an interview with the counselor and a signed statement agreeing to the terms for readmittance. If the terms for readmittance are not met, the student may be dropped from the course. The excessive absence report becomes a part of the student's permanent file.

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Instructional Support

COURSE SYLLABUS

TITLE TECHNICAL DRAFTING

NUMBER DDT 1105

LEC 3 LAB 7 CREDIT 5

PREREQUISITE: DDT 1104, DDT 1203

PREPARED BY: Ronnie Blair

APPROVED BY: Mike Cole

DATE: 12-20-90

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: _____ DATE: _____

_____ _____

_____ _____

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COURSE SYLLABUS

I. COURSE DESCRIPTION (CATALOG DESCRIPTION)

In this course, the student will apply the basic and general drafting techniques learned to more advanced technical drawings as related to manufacture and machine shop problems; techniques of lettering, sketching, dimensioning and inking will be reviewed. The student will learn machine drawing standards, safety codes, assembly details of machine parts, screws, fasteners, welds, threads, gears, cams, splines, dimensioning sheet metal layouts, tolerances and working drawings for parts to be manufactured to close tolerance.

II. COURSE OBJECTIVE (THE TERMINAL OBJECTIVE OF THE COURSE)

Upon completion of this course, the student will have learned the fundamentals of drafting and will have developed the necessary drafting skill to apply them to various drafting problems.

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COURSE SYLLABUS

III. COURSE OUTLINE

A: CONTENT

1. Multiview
2. Sections
3. Auxiliary
4. Descriptive geometry
5. Fasteners
6. Cams
7. Gears

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COURSE SYLLABUS

III. COURSE OUTLINE

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

The student will be able to:

1. draw one, two and three-view drawings
2. understand each kind of sectional view
3. draw the various standard drafting practices associated with auxiliary views.
4. understand the basic steps involved in descriptive geometry
5. use proper dimensions and notations
6. identify and draw many types of fasteners
7. understand the various steps in drawing cams
8. identify each kind of gear, know the various functions of each

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COURSE SYLLABUS

IV. REFERENCE MATERIAL

TECHNICAL DRAWING, by David L. Goetsch

V. SUPPLIES

paper

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Texas State Technical Institute

COURSE SYLLABUS

VI. GRADING PROCEDURE

Final grade will be determined by the following:

Drawings	80%
Professionalism	10%
Final Exam	10%

VII. ATTENDANCE POLICY

see attached sheet

Attendance policy

It is the policy of TSTI-Sweetwater to require students to attend classes punctually and regularly so that learning objectives of the course can be accomplished. An absence is assessed each time a student is not in attendance during a regularly scheduled period of instruction. The assessment does not depend on the cause for absence, and it applies to both instructional and laboratory sessions. In each quarter, the assessment of absences begins the first day after the student officially enrolls in the class. Each instructor will notify students of the attendance policy and procedures on the first day of class. Every effort on the part of the instructor will be made to enable students to make up missed work. However, it is the student's responsibility to make arrangements with the instructor to complete the work.

A student is considered excessively absent from a course when:

1. Absent from three consecutive periods of instruction after the date enrolled, or
2. Total absences equal the number of periods of instruction scheduled in two calendar weeks, or
3. In the judgment of the instructor, the student is not making satisfactory progress due to absence from class and it is not feasible for the student to make up the missed work.

The first day following the period in which a student became excessively absent, an excessive absence report is filed on the student in the Student Services Office. The student will not be readmitted to class without an interview with the counselor and a signed statement agreeing to the terms for readmittance. If the terms for readmittance are not met, the student may be dropped from the course. The excessive absence report becomes a part of the student's permanent file.

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Texas State Technical Institute
Instructional Support

COURSE SYLLABUS

TITLE INTRODUCTION TO CAD

NUMBER DDT 1503

LEC 2 LAB 4 CREDIT 3

PREREQUISITE: DDT 1203 and IMT 1013

PREPARED BY: Micheal Coler

APPROVED BY: Micheal Coler

DATE: 12-20-90

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: A. Bill Barnes DATE: 1-28-91

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COURSE SYLLABUS

I. COURSE DESCRIPTION (catalog description)

This is the introductory course to computer aided drafting and it is emphasized as a tool to provide quick access to data, produce working drawing for all disciplines and to save and store drawings for future reference, revision and modification on software and printouts. Emphasis is placed on the role of the computer as a tool or aid to the technical drafter. Prerequisite DDT 1104.

II. COURSE OBJECTIVE (the terminal objective of the course)

The students will learn to produce and plot complete drawings using AutoCAD.

III. COURSE OUTLINE

A. CONTENT

I. Looking at the CAD workstation
   - A. Input devices
     1. Keyboard
     2. Digitizer
     3. Mouse
   - B. Output devices
     1. Display screen
     2. Plotter
     3. Printer
   - C. CPU

II. Menus and coordinate system
   - A. Menus
     1. Screen
     2. Tablet
     3. Icon
   - B. Coordinate systems
     1. Absolute
     2. Relative
     3. Polar

III. Developing a prototype drawing
   - A. Setup
   - B. Layers
   - C. System variables

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COURSE SYLLABUS

IV. Drafting geometry
- A. Arc/circle
- B. Array
- C. Center
- D. Chamfer
- E. Copy
- F. Dimvars
- G. Draw
- H. Fillet
- I. Hatch
- J. Layer
- K. Line
- L. Move
- M. Offset
- N. Undo

V. Dimensioning and 2-D Drafting
- A. Change
- B. Dim
- C. Dtext
- D. Elevation
- E. Hide
- F. Leader
- G. Text
- H. V. Point
- I. Wblock

B. PERFORMANCE OBJECTIVES

I. Student will be able to identify computer components, terms and controls.

II. Student will be able to load AutoCAD and enter the main menu.

III. The student will be able to begin a drawing, and draw simple geometric figures (i. e. lines, circles, and arcs).

IV. The student will be able to combine these geometric figures to produce a mechanical drawing and save the drawing.

V. The student will understand the coordinate system of drawing on AutoCAD.

VI. The student will be able to recall a drawing, make modifications to it including dimensioning, and refile it.

VII. The student will be able to move through the menu system using keyboard or mouse.

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COURSE SYLLABUS

IV. REFERENCE MATERIAL
Understanding & Using AutoCAD, by John Lea and others.

V. SUPPLIES
Five 5.25 floppy disks

VI. GRADING PROCEDURES
Final grade in the course shall be determined by a percentage of drawings and professionalism. A suggested division:

Professionalism	10%
Final test	20%
Drawings	70%

VII. ATTENDANCE POLICY
Attendance shall be in accordance with current TSTI policy.

PROFESSIONALISM POINTS

a paraprofessional your attitude is reflected in your mature conduct and conscientious ork habits. It is assumed that you have this positive attitude and 100 points have been added to your grade already. Penally points will be subtracted from this 100 points for every infraction listed. Please read these carefully and be sure that you understand this policy.

PENALTY POINTS (FOR EACH OCCURRENCE)

Tardiness	3
Excessive break time	2
Absent	7
Smoking, dipping or chewing tobacco in class	4
Eating or drinking in class	3
Improper attire (see student handbook)	1
Rowdy behavior / horseplay	10
Uncooperative attitude uses to follow instructions or is disruptive to the class)	10

This system approved by:

R Blair

Instructor

Program Chairman

Dean of Instruction

Texas State Technical College Sweetwater

INSTRUCTIONAL SUPPORT

COURSE SYLLABUS

TITLE MANUFACTURING CIRCUITS

NUMBER MTC 2243

LEC 2 LAB 4 CREDIT 3

PREREQUISITE:

PREPARED BY: T. J. Beck

APPROVED BY: Bill Barnes

DATE: 9-29-92

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY:	DATE:

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MTC 2243 - MANUFACTURING CIRCUITS
2 - 4 - 3

I. COURSE TITLE

MANUFACTURING CIRCUITS

II. COURSE DESCRIPTION (catalog description)

An in-depth study of electricity in manufacturing, including Power Generation, Transmission, Circuits, Capacitors, Coils, AC & DC circuits, Kirchoff's Laws, Thevinin's Theorem, motor and machine control circuits and troubleshooting.

III. COURSE OBJECTIVE (the terminal objective of the course)

To familiarize the student with electronics, AC & DC circuits, components and industrial applications.

IV. COURSE OUTLINE

A. CONTENT - UNITS

1.0 An Abridged History of Electronics

- 1.1 Electricity and Early Communications
- 1.2 Electronics and the Vacuum Tube
- 1.3 Radio and Television
- 1.4 Semiconductors
- 1.5 Computors

2.0 Basic Theories and Concepts

- 2.1 Charges and Conductivity
- 2.2 Resistance
- 2.3 Current Flow and Potential Difference
- 2.4 OHM's Law
- 2.5 Magnetism

3.0 Basic Components

- 3.1 Wires and Conductors
- 3.2 Power Sources, Batteries and Power Supplies
- 3.3 Loads and Loading
- 3.4 Resistors
- 3.5 Capacitors
- 3.6 Inductors

4.0 DC Circuits

- 4.1 Basic Circuits - More OHM's Law
- 4.2 Series and Parallel Circuits
- 4.3 Kirchoff's Laws

5.0 AC Circuits

- 5.1 Differences Between AC and DC
- 5.2 Rectification
- 5.3 Transformers
- 5.4 Resonance
- 5.7 Filament Winding

6.0 Basic Applications

- 6.1 Test Equipment
- 6.2 Power Supplies
- 6.3 Filters and Regulation
- 6.4 Motors and Generators

7.0 Diodes

- 7.1 Cosntruction and Operation
- 7.2 Special Diodes

8.0 Transistors and Their Circuits

- 8.1 Transistor Fundamentals
- 8.2 Amplifiers: Gain and Feedback
- 8.3 Transistor Configurations
- 8.4 Specialized Circuits
- 8.5 Basic AM and FM Radios

9.0 Digital Logic

- 9.1 Number Systems
- 9.2 Logic and Truth Tables
- 9.3 Gates and Devices
- 9.4 Circuits and Applications

10.0 An Introduction to Computers

- 10.1 Basic Configurations
- 10.2 The Central Processing Unit
- 10.3 The Arithmetic Logic Unit
- 10.4 The Memory
- 10.5 Input/Output (I/O) Ports and Devices
- 10.6 Mass Storage

11.0 Putting Computers to Work

- 11.1 Programming and Languages
- 11.2 Hardware Vs. Software
- 11.3 Batch Vs. Interactive
- 11.4 Real-World Interaction
- 11.5 Sizes and Uses
- 11.6 Computer Crimes and Viruses

12.0 Industrial Applications

- 12.1 Electronic Controls
- 12.3 Process Control and Feedback Systems
- 12.4 Robotics
- 12.5 Automated Work Cells
- 12.6 Computer Integrated Manufacturing

13.0 Management Information Systems

- 13.1 Management Information Systems
- 13.2 Bookkeeping and Accounting
- 13.3 Report Generation
- 13.4 Desktop Management

14.0 Medical Applications

- 14.1 Diagnostic Equipment
- 14.2 Patient Monitoring
- 14.3 Operative Equipment
- 14.4 Medical Record Keeping

15.0 Communications

- 15.1 Radio Transmission Fundamentals
- 15.2 The Transmitter
- 15.3 The Receiver
- 15.4 Modulation Techniques
- 15.5 Television
- 15.6 Data Communications
- 15.7 Baud Rate
- 15.8 Medium
- 15.9 Modems
- 15.10 Protocol
- 15.11 High-Speed Data Networks

16.0 Military Applications

- 16.1 Communications and Cryptography
- 16.2 Radar and Sonar
- 16.3 Electronic Countermeasures
- 16.4 Guidance and Navigation
- 16.5 Star Wars

17.0 Home and Personal Uses

- 17.1 Personal Computers
- 17.2 Household Automation
- 17.3 Impact on the Quality of Life
- 17.4 Superconductivity

18.0 Applications in Education and Training

- 18.1 Early Efforts
- 18.2 The Computer Tutor
- 18.3 CBT systems
- 18.4 Software Development
- 18.5 Hardware
- 18.6 Videodisc Players

18.7 Digital Radio
18.8 The Future of CBT Systems

19.0 Optoelectronics

19.1 Electronic Inputs and Light Outputs
19.2 Light Inputs and electronic Outputs
19.3 Lasers
19.4 Transmission Media

B. PERFORMANCE OBJECTIVES

UNIT 1 The objective of this unit is to acquaint the student with the history of electronics.rical developments, recent uses in industry,

While completing this unit the student will:

A. Discuss how Joseph Henry, Samuel Morse, Alexander Graham Bell and Guglielmo Marconi contributed to the development of today's equipment.

B. Understand how vacuum tubes and cathode ray tubes work.

C. Discuss the major developments in the history of semiconductors and the beginning of computers.

UNIT 2 The objective of this unit is to introduce the basic atomic structure and electron movement, as well as basic terms including voltage, current, resistance and OHM's Law.

While completing this unit the student will:

A. Understand the atomic construction, attraction, and repulsion of charged particles.

B. Understand the concept of resistance, current flow and potential difference.

C. Know how to apply OHM's Law.

D. Describe the reaction which occurs when a wire is passed through a magnetic field.

UNIT 3 The objective of this unit is to enable the student to understand the definition and purpose of wires, conductors, loads, power supplies, fuses, capacitors and inductors.

While completing this unit the student will:

A. Understand the principle of wire gage and resistance in wire.

B. Understand electron flow in AC and DC through a simple resistive circuit.

C. Know how fuses and circuit breakers work.

D. Determine a resistor's value and tolerance.

E. Understand and apply the power formulas.

F. Understand how capacitors and inductors work.

UNIT 4 The objective of this unit is to enable the student to understand principles of simple DC circuit breakers and the tools and formulas to analyze them.

While completing this unit the student will:

A. Recognize the schematic diagram symbols and know how to apply Ohm's Law in simple circuits.

B. Know the difference between series and parallel circuits and how to calculate currents for both.

C. Know and apply Kirchoff's Law.

UNIT 5 The objective of this unit is to enable the student to understand how AC circuits work.

While completing this unit the student will:

A. Know the difference between AC and DC.

B. Understand the concept of a simple generator and the wave form it generates.

C. Understand three-phase AC generation and its wave form.

D. Understand capacitor-charging waveforms, rectification, transformers and resonance.

UNIT 6 The objective of this unit is to enable the student to demonstrate the use of test equipment (multimeters and oscilloscopes), power supplies, motors and generators.

While completing this unit the student will:

A. Use a multimeter to check AC or DC voltage, current and resistance in a circuit.

B. Operate an oscilloscope and identify the wave forms produced.

C. Apply the principles of bridge rectifier circuits.

UNIT 7 The objective of this unit is to familiarize the student with the principles and applications of diodes.

While completing this unit the student will:

A. Describe the behavior of N- and P-type materials and how they affect current flow.

B. Describe how xener, silicon-controlled rectifier, and light-emmitting diodes work and how they are used.

UNIT 8 The objective of this unit is to familiarize the student with the principles and applications of transistors and their circuits.

While completing this chapter the student will:

A. Identify the similarities and differences between vacuum tubes and transistors.

B. Describe the principle of amplifiers, including the concepts of gain and feedback.

C. Demonstrate three ways to connect a transistor and basic AM and FM radios.

UNIT 9 The objective of this unit is to familiarize the student with the principles and application of Digital Logic.

While completing this unit the student will:

A. Apply the principles of binary, octal and hexi-decimal numbering systems.

B. Describe the principles of logic and truth tables, gates and devices.

UNIT 10 The objective of this unit is to introduce the student to the general set-up and logic of computers.

While completing this unit the student will:

A. Describe the basic configurations of computers.

B. Identify the block diagrams of CPU, ALU, I/O, RAM, ROM, EPROM and mass storage.

UNIT 11 The objective of this unit is to familiarize the student with the basics of computer numbering systems, languages, operations hardware and software.

While completing this unit the student will:

A. Describe what machine code, assembler, FORTRAN, BASIC and COBOL are and what they are used for.

B. Define hardware, software and firmware.

C. Tell what viruses are.

UNIT 12 The objective of this unit is to enable the student to understand how automation is used in today's factories.

While completing this unit the student will:

A. Demonstrate how programmable logic controllers are used.

B. Describe how a closed-loop feedback system works.

C. Tell how robotics and end effectors are used.

D. Identify the interrelationships of CAD, CAM and CIM and how each works.

UNIT 13 The objective of this unit is to introduce the student to the business applications of computers and electronics.

While completing this unit the student will:

A. Describe how information management systems are used by managers.

B. Identify how computers are used in bookeeping and accounting operations, and in report generation.

UNIT 14 The objective of this unit is to provide the student with some insight into state-of-the-art electronic medical equipment.

While completing this unit the student will:

A. List several electronic instruments or pieces of equipment theat are used for diagnostic purposes.

B. Describe the purpose and functioning of a blood test machine, CAT scanner, field analyzer, HP monitoring system, defibrillator.

UNIT 15 The objective of this unit is to provide the student with a survey of communications processes and equipment in terms of the electronics principles learned in this course.

While completing this unit the student will:

A. Explain why audio signals need to be modulated before transmission.

B. For television broadcasting, describe how audio and video information are transmitted.

C. Explain what baud rate means.

D. List the different configurations in which communication systems can be connected.

E. For communications protocol, list and describe the different types of data flow.

UNIT 16 The objective of this unit is to extend the student's knowledge of electronics to include a brief survey of military applications.

While completing this unit the student will:

A. Define cryptography and describe some applications of it.

B. Classify several types of radar and their uses.

C. Explain the operation of an IFF.

D. Identify and explain two types of guidance systems.

UNIT 17 The objective of this unit is to give the student a brief summary of electronics uses in the home, including personal computers and home automation.

While completing this unit the student will:

A. Explain the difference between a mainframe and a personal computer.

B. List several software programs available for a household PC.

C. Use block diagrams to prepare a design for a computerized home.

D. Describe some of the developments in home automation.

UNIT 18 The objective of this unit is to provide the student with an overview of developments in electronics in education and training.

A. Describe some of the hardware systems used in training and education.

B. Describe some of the software programs developed for training systems.

UNIT 19 The objective of this unit is to provide a brief introduction to the field of optoelectronics.

While completing this unit the student will:

A. Explain the differences between LCD and LED.

B. Discuss the four basic catagories of optoelectronics.

C. Describe how a TV picture tube works.

D. Describe some examples of devices with light inputs and electronic outputs.

E. Illustrate how a laser works.

V. REFERENCE MATERIAL

Electronics Fundamentals & Everyday Applications,
David P. Beach and William T. Foraker. Delmar Publishers
ISBN 0-8273-4643-3.

VI. SUPPLIES

Loose Leaf Notebook
Calculator
Paper
Pens
Pencils
Ruler

VI. GRADING STRUCTURE

90 - 100	= A
80 - 89	= B
70 - 79	= C
60 - 69	= D
0 - 59	= F

Chapter quizzes:	= 40%
Homework Assignments	= 10%
Laboratory Projects	= 20%
Final Exam	= 30%

VII. ATTENDANCE POLICY

Students are required to attend class punctually and regularly. An absence will be assessed each time a student is not in attendance during a regularly scheduled period of instruction. Students will be assessed an absence for each three tardies.

A student is considered excessively absent when:

1. Absent from three consecutive periods of instruction.
2. Total absences equal eight.
3. In the judgement of the instructor, the student is not making satisfactory progress due to absences from class.

The first day following the period in which a student becomes excessively absent, an excessive absence report will be filed on the student in the Student Services Offices. The student will not be readmitted to class without an interview with the counselor and presentation of a signed statement agreeing to the terms for readmittance. If these terms are not met, the student may be droppped from the course. The excessive absence report becomes a part of the student's permanent file.

A period of instruction is one or more continuously schduled hours of lecture or laboratory instruction for a course. Early departure from a period of instruction will be treated the same as a tardy.

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Texas State Technical Institute
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COURSE SYLLABUS

TITLE INDUSTRIAL WIRING

NUMBER ART 226

LEC 1 LAB 3 CREDIT 2

PREREQUISITE:

PREPARED BY: Gary W. Rhoades

APPROVED BY: Gary W. Rhoades

DATE: 01-28-91

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: [signature] DATE: 1-28-91

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JAN 28 1991
INST. DIVISION
STI-SWEETWATER

INDUSTRIAL WIRING

ART 226

COURSE DESCRIPTION:

The study of the requirements specified by the National Electrical Code as minimum requirements for an approved electrical installation which includes all aspects of electrical installation from the standpoint of safety for personnel and equipment.

COURSE OBJECTIVES:

To develop basic skills in industrial wiring for the purpose of installing and servicing, power, lighting and special services And to provide additional additional electrical capacity in an automated system and for periodic maintenance and repair of various systems and components.

PERFORMANCE OBJECTIVES:

After completing the study of this course the student will:

1. Select the proper high voltage fuse, make tap adjustments and proper ground connections.
2. List and identify the purposes of various components of busways.
3. Determine and describe the number and types of panels needed and the methods by which they are supplied with power.
4. Install three-phase trolley busways, lighting busways and strain reliefs on cord drops.
5. Install master clocks, program systems, alarm systems and signal systems.
6. Describe and install precipitation units, define and use the concept of power factor with synchronous condenser.
7. Understand and determine the needs of air conditioning and heating controls.
8. Identify and install system protectors, circuit breakers, fuses and ground-fault protective devices. As well as make proper adjustments to these devices.
9. Select and install lamp selection, power demand and control options for machine lighting.
10. Install signal wiring for programmable logic controllers.
11. Understand the industrial electrical specifications and codes.

INDUSTRIAL WIRING

ART 226

COURSE OUTLINE:

I. Introduction:

a. Course description
b. Course Objectives
c. Performance Objectives
d. Course Outline
e. Course Requirements

1. Keeping a notebook
2. Use of library and reference material
3. Lab exercises
4. Written reports
5. Tests
6. Grades
7. Classroom policy

II. The Unit Substation

a. The high voltage section
b. The transformer section
c. The low voltage section
d. High voltage metering equipment

III. Feeder Bus System

a. Feeder ducts
b. Feeder busway 1
c. Feeder busway 2
d. Circuit breaker cubicles
e. Plug-in busway
f. Methods of suspension
g. Bus plugs

IV. Panelboards and Subfeeders

a. Panelboards
b. Lighting and appliance panelboards
c. Branch-circuit protective device
d. Power panelboards

V. Trolley Busways

a. Three-phase trolley busways
b. The trolley busway run
c. Feed-in adapter
d. Yhe trolleys
e. Conduit run
f. Trolley busway run B,C and D
g. Lighting in the manufacturing area
h. Bus bars

COURSE OUTLINE cont'd:

VI. Signaling Systems

a. The master clock
b. The program system
c. The fire alarm system
d. The paging system
e. Wiring of signaling circuits

VII. Special Equipment

a. The precipitation unit
b. Fan assembly
c. Loading on AC circuits
d. Power factor measurement
e. The synchronous condenser
f. Tie-ins

VIII. Ventilating, Air Conditioning and Heating Facilities

a. The ventilator and exhaust system
b. Cooling equipment
c. Liquid chillers

IX. Systems Protection

a. System protection
b. Circuit breaker time-current characteristics
c. Fuse time-circuit Characteristics
d. Ground fault time-current Characteristics

X. Site Lighting

a. Lamp selection
b. Illuminance selection
c. Power Limitations
d. Luminaire placement
e. Electrical installation

XI. Programmable Logic Controllers

a. PLC and common computer differences
b. Basic components
c. The CPU
d. The I/O track
e. Internal relays
f. Instalation
g. The differential amplifier

COURSE OUTLINE cont'd:

XII. Electrical Specifications

a. Materials
b. Lighting
c. Receptacles and switches
d. Conduit
e. Conductors
f. Lighting and power panels
g. Outlet boxes and fittings
h. Dry-type transformers
i. Motor branch circuits and feeders
j. Precipitation units
k. Synchronous condensers

XIII. Motors and Controllers

a. Machines and motors
b. Single-speed squirrel cage induction motor
c. Four-speed squirrel-cage motors
d. Wound rotor induction motor
e. DC power supply

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COURSE SYLLABUS

IV. REFERENCE MATERIAL

A. Electrical Wiring, Residential
Ray C. Mullin, 9th Edition

B. National Electrical Code Book

V. SUPPLIES

none required

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COURSE SYLLABUS

VI. GRADING PROCEDURE

Final grade to consist of 70% lecture, 30% lab.

A. Tests = 70%

B. Lab and report = 30%

VII. ATTENDANCE POLICY

A student is considered excessively absent from the course when,

1. absent from three consecutive periods of instruction after the date enrolled, or

2. total absences equal the number of periods of instruction scheduled in two calendar weeks, or

3. in the judgment of the instructor, the student is not making satisfactory progress due to absence from class and it is not feasible for the student to make up the missed work.

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Texas State Technical Institute
Instructional Support

COURSE SYLLABUS

TITLE INTRODUCTION TO COMPUTER APPLICATIONS

NUMBER IMT 1013

LEC 2 LAB 4 CREDIT 3

PREREQUISITE: NONE

PREPARED BY: NELLIE GOSSETT

APPROVED BY: Nellie Gossett

DATE: SEPTEMBER 1991

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: Bill Barnes DATE: 5-12-92

TSTC - SWEETWATER

COURSE SYLLABUS

I. COURSE DESCRIPTION (Catalog Description)

This course is an introduction to microcomputer operations and the use of application software including wordprocessing, electronic spreadsheets, and relational database.

Prerequisite: NONE

II. COURSE OBJECTIVE (The terminal objective of the course)

Students will gain on-hands experience in the operation of a personal computer keyboard and learn how to apply these techniques to a varied range of application software packages. An introduction to general hardware and peripheral operations will be given and students will gain practical knowledge through assignments made based upon the software introduced.

COURSE SYLLABUS

III. COURSE OUTLINE

A. CONTENT

1.0 Operations

1.1 Introduction

1.2 Operations on the Microcomputer

2.0 Word Processing

2.1 Access and Layout

2.2 Creating and Printing a Document

2.3 Document Modification

2.4 Block Commands

2.5 Other Commands

3.0 A Spreadsheet Package

3.1 Access and Layout

3.2 Building a Spreadsheet

3.3 Formatting a Spreadsheet

3.4 Printing a Spreadsheet

3.5 Cell Copy and Replication

4.0 Data Base Management Systems

4.1 Introduction

4.2 Access and Layout

4.3 Record Manipulation

4.4 Sorting and Report Generation

4.5 Adding, Deleting, and Editing Records

5.0 MS-DOS

5.1 Disk Operating System (DOS)

III. COURSE OUTLINE

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

1.0 Operations

Instructional Goal:

Students will discuss terminology in connection with the computer, data processing, various peripheral units, and diskettes. The students will begin operations on the microcomputer and learn start-up and power down techniques.

Unit Objectives:

1.1 Introduction

1.1.1 The Computer
1.1.2 Input/Processing/Output
1.1.3 Auxiliary Storage
1.1.4 Software

1.2 Operations on the microcomputer

1.2.1 The keyboard
1.2.2 The disk drives (A: & B:)
1.2.3 Main Computer Storage
1.2.4 System Start-Up (BOOT) and Power Down

2.0 Word Processing - Word Perfect

Instructional Goal:

Students will be trained utilizing a popular word processing package. The emphasis will be on document creation, printing, modification, and manipulation. Finally, block commands and various commands that aid in necessary operations vital to a word processing document are demonstrated.

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Unit Objectives:

2.1 Typing, Saving, Printing a Simple Letter

2.2 Creating a Document with Word Wrap, Cursor Movement keys, Deleting/Restoring Text

2.3 Special Features
- 2.3.1 Moving Text Flush Right
- 2.3.2 Centering Text
- 2.3.3 Boldfacing Text
- 2.3.4 Underlining Text
- 2.3.5 Inserting Text
- 2.3.6 Backspace Key
- 2.3.7 Typeover Command
- 2.3.8 Indent Key/Left & Right Indent Keys
- 2.3.9 Saving and Replacing a Document

2.4 Modifying a Document
- 2.4.1 Inserting Changes into Text
- 2.4.2 Default Settings
- 2.4.3 Line Formatting
- 2.4.4 Previewing
- 2.4.5 Print Formatting
- 2.4.6 Page Formatting
- 2.4.7 Advanced Tab Settings

3.0 A Spreadsheet Package - VP Planner

Instructional Goal:

Students will be introduced to a popular spreadsheet package and will demonstrate their understanding of it through completed exercises in spreadsheet construction, formatting, printing, and cell replication.

Unit Objectives:

3.1 Building a Spreadsheet
- 3.1.1 Cell, Cell Cursor, and Window
- 3.1.2 Control Panel and Current-Mode Line
- 3.1.3 Moving Cell Cursor one cell at a time
- 3.1.4 Entering Labels
- 3.1.5 Entering Numbers
- 3.1.6 Moving Cell Cursor more than one cell at a time
- 3.1.7 Entering Formulas

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3.1.8 Saving a Spreadsheet
3.1.9 Correcting Errors
3.1.10 Online Help Facility
3.1.11 Quitting

3.2 Formatting and Printing a Spreadsheet
3.2.1 Retrieving a Spreadsheet
3.2.2 Changing Width of Columns
3.2.3 Defining a Range
3.2.4 Formatting Numeric Values
3.2.5 Repeating Characters in a Cell
3.2.6 Replication - Copy Command
3.2.7 Using Built-In Functions
3.2.8 Determining a Percent Value
3.2.9 Formatting to Percent and Currency
3.2.10 Printing a Spreadsheet
3.2.11 Debugging Formulas Using Text Format

3.3 Enhancing the Spreadsheet
3.3.1 Varying the Width of Columns
3.3.2 Formatting Worksheet Globally
3.3.3 Displaying Date and Time
3.3.4 Inserting/Deleting Rows/Columns
3.3.5 Copying Cells with Equal Source & Destination Ranges
3.3.6 Entering Numbers with Percent Sign
3.3.7 Freezing Titles
3.3.8 Moving Contents of Cells
3.3.9 Displaying Formulas and Functions in Cells
3.3.10 Absolute Versus Relative Addressing
3.3.11 Pointing to a Range of Cells
3.3.12 What-If Questions
3.3.13 Changing Worksheet Default Settings
3.3.14 Changing Screen to Look Like Lotus 1-2-3 Screen
3.3.15 The Undo and Redo Keys
3.3.16 Interacting with DOS

4.0 Database Management Using DBASE III PLUS

Instructional Goal:

The student will obtain practical experience using DBASE III PLUS as a functional tool for business applications including file creation, record manipulation, sorting and report generation, and adding, deleting and editing records.

Unit Objectives:

4.1 Creating and Displaying a Database
- 4.1.1 Planning a Database File
- 4.1.2 Using dBASE III PLUS
- 4.1.3 The ASSISTANT
- 4.1.4 Creating a Database
- 4.1.5 Entering Data
- 4.1.6 Displaying Data
- 4.1.7 Backing up Database Files

4.2 Displaying Records in a Database
- 4.2.1 Activating the Database
- 4.2.2 Displaying Database Structure
- 4.2.3 Display
- 4.2.4 Calculations

4.3 Sorting and Report Preparation
- 4.3.1 Sorting
- 4.3.2 Reports

5.0 MS-DOS

Instructional Goal:

Students will discuss terminology in connection with MS-DOS operation and MS-DOS commands.

Unit Objectives:

1.1 Introduction
- 1.1.1 Using the Disk Operating System
- 1.1.2 Entering Disk Operating System (DOS) Commands
- 1.1.3 Directory Commands (DIR)
- 1.1.4 Formatting a Diskette
- 1.1.5 CLS Command
- 1.1.6 Managing Data & Program Files on Disks
- 1.1.7 Copy Command
- 1.1.8 Rename Command
- 1.1.9 Erase and Del Commands
- 1.1.10 Using Directories & Subdirectories

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IV. REFERENCE MATERIAL

Textbook: Learning to Use WordPerfect, VP-Planner Plus and dBASE III Plus; by Gary B. Shelly and Thomas J. Cashman; Boyd and Fraser, 1990.

Module Book: IMT 1013 - Introduction to Computer Applications; by Information Management Staff, Texas State Technical College, Sweetwater, Fall, 1991.

V. SUPPLIES

Two floppy diskettes as specified by instructor are needed for this course. The disks will be used for storing your working and backup files. The educational software used in this course is available free of charge by Boyd & Fraser to anyone purchasing new textbooks and represents actual working packages as similarly used in industry. If you would like to obtain a copy, ask your instructor for the educational versions.

Paper & Pencil or Pen for taking class notes.

VI. GRADING PROCEDURE

The course grade will come from three areas: (1) attendance, (2) unit assignments, and (3) unit tests.

Due dates for all lab assignments will be defined at the beginning of the quarter. A penalty of 5 points per day will be deducted from the grade of any work turned in after the scheduled due date. Tests must be taken on the date assigned unless prior arrangements are made with the instructor or lab assistant. NO EXCEPTIONS!!!!!

Course grades will be determined by the following criteria:

Attendance	10%
Unit Assignments	40%
Unit Tests	50%
Total	100%

Final letter grades will be based on average points at the end of the quarter. The assessment will be according to the following scale:

90 - 100 = A
80 - 89 = B
70 - 79 = C
* 60 - 69 = D
Under 60 = Failing

*This course grade is not passing in your major field of study and will not be applied toward graduation; therefore, you must retake any major course that you receive a D in if you wish to graduate.

VII. ATTENDANCE POLICY

It is the policy of TSTC-Sweetwater to require students to attend classes punctually and regularly so that learning objectives of the course can be accomplished. An absence is assessed each time a student is not in attendance during a regularly scheduled period of instruction. The assessment does not depend on the cause for absence, and it applies to both instructional and laboratory sessions. In each quarter, the assessment of absences begins the first day of scheduled classes. Each instructor will notify students of the attendance policy and procedures on the first day of class. Every effort on the part of the instructor will be made to enable students to make up missed work. However, it is the student's responsibility to make arrangements with the instructor to complete the work.

A student is considered excessively absent from this course when:

1. Absent from three consecutive periods of instruction after the date enrolled, or
2. Total absences equal the number of periods of instruction scheduled in two calendar weeks, or
3. In the judgment of the instructor, the student is not making satisfactory progress due to absence from class and it is not feasible for the student to make up the missed work.

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The first day following the period in which a student became excessively absent, an excessive absence report is filed on the student and sent to the student's major department academic advisor. The student will not be re-admitted to class without an interview with the academic advisor and a signed statement agreeing to the terms for re-admittance. If the terms for re-admittance are not met, the student may be dropped from the course. The excessive absence report becomes a part of the student's permanent file.

A period of instruction is one or more continuously scheduled hours of either theory or laboratory instruction for a course.

TSTI SWEETWATER

Texas State Technical Institute

COURSE SYLLABUS

I. COURSE DESCRIPTION (CATALOG DESCRIPTION)

MTC 1123 - MANUFACTURING PROCESSES

An in-depth study of manufacturing processes including casting, molding, hot and cold forming, material removal, joining and assembly. The course includes an introduction to the structure and types of industrial materials and includes principles of manufacturing organization and quality control.

II. COURSE OBJECTIVE (THE TERMINAL OBJECTIVE OF THE COURSE)

To familiarize the student with the organizational structure, manufacturing processes, materials, inspection techniques and equipment used in industry today.

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COURSE SYLLABUS

III. COURSE OUTLINE

A: CONTENT

(SEE SHEETS 1 - 5)

MTC 1123
MANUFACTURING PROCESSES
COURSE OUTLINE

I. ORIENTATION

II. HUMAN NEEDS IN MANUFACTURING

III. ORGANIZING AND PLANNING FOR MANUFACTURING

- A. Development of Modern Manufacturing
- B. Organizing for Manufacturing
- C. Producibility Principles
- D. Production Planning and Tooling
- E. Manufacturing Costs

IV. PRINCIPLES OF CASTING AND MOLDING

- A. Catagories of Castings
- B. Comparison of Casting Methods
- C. Casting of Metals
- D. Casting/Molding of Nonmetallic Materials
- E. Quality in Casting

V. PATTERNS, CORES, MOLDS AND DIES

- A. Casting Design
- B. Patterns
- C. Basic Mold Construction
- D. Dies

VI. GRAVITY CASTING PROCESSES

- A. Lost Wax Casting
- B. Precision Investment Casting
- C. Full Mold Process
- D. High-Vacuum Casting
- E. Sand Casting
- F. Controlling Sand Characteristics
- G. Casting Concrete

VII. PRESSURE CASTING AND MOLDING PROCESSES

- A. Die Casting
- B. Injection Molding
- C. Blow Molding
- D. Compression Molding
- E. Transfer Molding
- F. Centrifugal Casting
- G. Continuous Casting
- H. Lay-up Molding
- I. Thermoplastic Molding Processes

VIII. MATERIALS-FORMING TECHNOLOGY

A. Hot-Forming
B. Cold-Forming
C. Pressing
D. Drawing
E. Bending
F. Shearing

IX. HOT AND COLD FORMING PROCESSES

A. Impact Forming
B. Pressure Forming
C. Smith Forging
D. Drop Forging
E. Impact Forging
F. Upset Forging
G. Swaging
H. Press Forging
I. Coining
J. Hobbing
K. Rolling
L. Roll Forging
M. Roll Forming
N. Pipe Making
O. Drawing
P. Extruding
Q. Shearing Processes

X. SPECIAL FORMING PROCESSES

A. Powder Metallurgy
B. High Energy Rate Forming
C. Hydroforming
D. Magnetic Forming

XI. TECHNOLOGY OF MATERIAL REMOVAL

A. Machinability
B. Chip Formation
C. Cutting Tool Materials
D. Cutting Tool Geometry
E. Lubrication

XII. PRINCIPLES OF MATERIAL CUTTING

A. Cutting Action
B. Cutting Speed
C. Depth of Cut
D. Feed
E. Machine Tools

XIII. MACHINE TOOL TECHNOLOGY

A. Lathes
B. Shapers
C. Planers
D. Broaches
E. Milling Machines
F. Drilling and Related Tools
G. Saws
H. Grinding and Related Tools
I. Related abrasive machines

XIV. SPECIAL MATERIAL REMOVAL PROCESSES

A. Abrasive-Jet Machining (AJM)
B. Ultrasonic Machining (USM)
C. Liquid-jet Material Removal Process
D. Electrochemical Machining
E. Electrochemical Grinding
F. Electrochemical Honing
G. Chemical Machining or Milling
H. Chemical Engraving
I. Chemical Blanking
J. Electrodischarge Metal-Removal Process (EDM)
K. Micromachining and Related Processes

XV. THE TECHNOLOGY OF JOINING PROCESSES

A. Fastening
B. Bonding
C. Mechanical Fasteners
D. Adhesive Bonding

XVI. INTRODUCTION TO WELDING TECHNOLOGY

A. Destructive Testing
B. Fracture Tests
C. Tensile Test
D. Bend Test
E. Metallographic Tests
F. Non-Destructive Testing
G. Visual Inspection
H. Magnetic Particle Inspection
I. Liquid Penetrant Tests
J. Ultrasonic Tests
K. Radiographic Tests
L. Weld Defects
M. Welding Plastics

MTC 1123 - MANUFACTURING PROCESSES
COURSE OUTLINE

XVII. WELDING PROCESSES AND EQUIPMENT

A. Solid State Welding
B. Resistance Welding
C. Gas Welding
D. Arc Welding
E. Stud Welding
F. Electron Beam Welding
G. Lasar Beam Welding
H. Electroslag Welding
I. Induction Welding
J. Thermit Welding

XVIII. NATURE, PROPERTIES AND TYPES OF MATERIALS

A. Atomic Theory
B. Atomic Bonding
C. Structure of Industrial Materials
D. Crystal Structure of Metallic Materials
E. Grain Structure in Metals
F. Alloying Metallic Materials
G. Structure of Ceramic Materials
H. Structure of Organic Materials
I. Production of Cast Iron
J. Steel Production
K. Types, Properties and Uses of Steel
L. Production of Nonferrous Metallic Materials
M. Production of Plastics

XIX. INTRODUCTION TO MATERIALS TESTING

A. Destructive Testing
B. Nondestructive Testing

XX. HEAT TREATMENT OF MATERIALS

A. Basic Concepts of Heat Treatment
B. Tempering (Softening) Processes
C. Annealing
D. Surface Hardening Processes
E. Heating Equipment
F. Heat Treatment of Non-Metallic Material
G. Heat Treating of Plastics

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XXI. SURFACE CLEANING AND FINISHING PROCESSES

A. Mechanical Cleaning Processes
B. Chemical Cleaning Processes
C. Ultrasonic Cleaning
D. Steam Cleaning
E. Organic Finishes
F. Powder Coatings
G. Metallic Coatings
H. Phosphate Coating
J. Porcelain/Ceramic Coatings

XXII. MANUFACTURING SPECIFICATIONS AND QUALITY CONTROL

A. Specifications and Standards
B. American National Standards Institute (ANSI)
C. American Society of Mechanical Engineers (ASME) Standards.
D. Screw-Thread Standards
E. Unified and American National Screw Thread Standard
F. Gear Specifications
G. Quality Control

XXIII. TECHNOLOGY OF ASSEMBLING MANUFACTURED PARTS

A. Mass (Line) Production
B. Classes and Types of Fits
C. Jigs and Fixtures

XXIV. INTRODUCTION TO MASS PRODUCTION AUTOMATION

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Texas State Technical Institute

COURSE SYLLABUS

III. COURSE OUTLINE

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

1. Describe the capabilities of the various manufacturing machines.
2. Describe the manufacturing processes and capabilities.
3. Apply the basic theories about the nature and structure of materials to the selection of industrial materials.
4. Identify equipment and machinery necessary for a small manufacturing company.
5. Apply the principles of inspection, testing and quality control.

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Texas State Technical Institute

COURSE SYLLABUS

IV. REFERENCE MATERIAL

TEXT BOOK: Basic Manufacturing Processes. H.C. Kazanas, Glenn E. Baker and Thomas G. Gregor. McGraw-Hill, 1981.

REFERENCE BOOK: Machinery's Handbook. Eric Oberg et. al.

V. SUPPLIES

Six-inch Dial Vernier Caliper

TSTI SWEETWATER

Texas State Technical Institute

COURSE SYLLABUS

VI. GRADING PROCEDURE

5 Unit Tests	50%	100 - 90 = A
Lab Assignments	25%	89 - 80 = B
Final Exam	25%	79 - 70 = C
		Below 70 = F

VII. ATTENDANCE POLICY

It is the policy of TSTI-Sweetwater to require students to attend classes punctually and regularly so that learning objectives of the course can be accomplished. An absence is assessed each time a student is not in attendance during a regularly scheduled period of instruction. The assessment does not depend on the cause for absence, and it applies to both instructional and laboratory sessions. In each quarter, the assessment of absences begins the first day of scheduled classes. Each instructor will notify students of the attendance policy and procedures on the first day of class. Every effort on the part of the instructor will be made to enable students to make up missed work. However, it is the student's responsibility to make arrangements with the instructor to complete the work.

(continued)

TSTI SWEETWATER

Texas State Technical Institute

COURSE SYLLABUS

A student is considered excessively absent from the course when:

1. Absent from 3 consecutive periods of instruction after the date enrolled, or
2. Total absences equal the number of periods of instruction scheduled in 2 calendar weeks, or
3. In the judgement of the instructor, the student is not making satisfactory progress due to absence from class and it is not feasible for the student to make up missed work.

The first day following the period in which a student becomes excessively absent, an excessive absence report is filed on the student in the Student Services Offices. The student will not be readmitted to class without an interview with the counselor and a signed statement agreeing to the terms for readmittance. If the terms for readmittance are not met, the student may be dropped from the course. The excessive absence report becomes part of the student's permanent file.

A period of instruction is one or more continuously scheduled hours of either theory or laboratory instruction for a course.

Texas State Technical College Sweetwater

INSTRUCTIONAL SUPPORT

COURSE SYLLABUS

TITLE FUNDAMENTALS OF METALLURGY

NUMBER MTC 1213

LEC 3 LAB 3 CREDIT 3

PREREQUISITE:

PREPARED BY: Tom Beck

APPROVED BY: Bill Bauer

DATE: September 8, 1995

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY:	DATE:

COURSE SYLLABUS
MTC 1213 - FUNDAMENTALS OF METALLURGY
3 - 3 - 3

I. COURSE DESCRIPTION

A comprehensive study of refining properties, mechanical properties, and physical properties of ferrous and nonferrous materials, including the theory of alloys, heat treatment and testing.

II. COURSE OBJECTIVE

To enable the student to recognize the types of ferrous and nonferrous metals and alloys, their defects and conditions, and to understand the principles for using these materials in a manufacturing environment.

III. COURSE OUTLINE

A. CONTENT - UNITS

1.0 Introduction
- 1.1 Knowledge of Metals
- 1.2 Science of Metallurgy
- 1.3 Artistic and Practical Metallurgy
- 1.4 Scientific Research and New Technology Metals
- 1.5 Production of Metals

2.0 Iron and Steel Production
- 2.1 Wrought Iron
- 2.2 Iron Ores
- 2.3 Purification Processes
- 2.4 The Blast Furnace
- 2.5 Production of Iron
- 2.6 Steel Making and Steel Casting

3.0 Nonferrous Metal Production
- 3.1 Nonferrous Metals
- 3.2 Metallic Ores
- 3.3 Aluminum
- 3.4 Copper
- 3.5 Magnesium
- 3.6 Nickel
- 3.7 Lead
- 3.8 Tin
- 3.9 Titanium
- 3.10 Zinc
- 3.11 Zirconium
- 3.12 Beryllium

4.0 The Measurement of Metal Properties
- 4.1 Metal Testing and Control
- 4.2 Dimensional Measurement
- 4.3 Chemical Measurement
- 4.4 Metal Defects and Their Causes
- 4.5 Non-destructive Testing
- 4.6 Hardness Testing
- 4.7 Tensile Testing
- 4.8 Impact Testing
- 4.9 Metallography
- 4.10 Thermometry

III. COURSE OUTLINE
A. CONTENTS, continued

5.0 Crystals and Atoms
- 5.1 Structure of Atoms
- 5.2 Classification of Elements
- 5.3 Structure of Metals
- 5.4 Crystallization of Metals

6.0 Metal Solutions and Phases
- 6.1 Alloy System
- 6.2 Solid Solutions
- 6.3 Solidification of Pure Metals and Alloys
- 6.4 Solid Solution Alloys
- 6.5 Eutectic Alloys
- 6.6 Iron-Carbon Alloys

7.0 Heat Treatment
- 7.1 Phase Relationship
- 7.2 Types of Heat Treatment
- 7.3 Nonferrous Metal Heat Treatment
- 7.4 Types of Nonferrous Heat Treatment
- 7.5 Mechanics of Cooling
- 7.6 Hardenability
- 7.7 Surface Heat Treatment (Case Hardening)

8.0 Carbon and Iron Alloys
- 8.1 Carbon-Iron Alloy Metals
- 8.2 Allotropic Forms of Iron
- 8.3 Critical Temperature of Allotropic Change
- 8.4 Heating and Cooling Changes
- 8.5 Cast Irons
- 8.6 Wrought Irons

9.0 Alloy Steels
- 9.1 Metal Requirements
- 9.2 Alloy Elements in Steels
- 9.3 Types of Alloy Steels
- 9.4 Stainless Steels
- 9.5 Tool Steel Alloys
- 9.6 Tool Steel Selection

10.0 Common Nonferrous Alloys
- 10.1 Aluminum Alloys
- 10.2 Forming Aluminum Alloys
- 10.3 Nonheat-treatable Alloys
- 10.4 Heat-treatable Alloys
- 10.5 Aluminum-Copper Alloys
- 10.6 Surface Coatings
- 10.7 Copper Alloys
- 10.8 Copper-Nickel Alloys
- 10.9 Nickel-Iron Alloys
- 10.10 Nickel-Silver Alloys
- 10.11 Magnesium Alloys
- 10.12 Magnesium-Aluminum Alloys
- 10.13 Magnesium-Thorium Alloys
- 10.14 Magnesium-Lithium Alloys
- 10.15 Titanium Alloys

III. COURSE OUTLINE

A. CONTENTS, continued

11.0 Metal Manufacturing Processes
- 11.1 Metal Forming Processes
- 11.2 Casting of Metals
- 11.3 Powder Metallurgy
- 11.4 Hot and Cold Working of Metals
- 11.5 Welding and Brazing
- 11.6 Gas Welding
- 11.7 Electric Arc Welding
- 11.8 Gas Metal-Arc Welding
- 11.9 Plasma Arc Welding
- 11.10 Electron Beam Welding
- 11.11 Cold Forming
- 11.12 Machining

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

UNIT 1
The object of this unit is to acquaint the student with the science of metallurgy--artistic and practical--and the production of metals.
While completing this unit, the student will:
1. Define and understand the properties of metals.
2. Describe the importance of the microscope in the history of metals.
3. Explain how chemical elements are listed in the Table of Periodic Properties of Elements.
4. Discuss the two common processes used in mineral separation.

UNIT 2
The objective of this unit is to understand how wrought iron is produced, the role of iron ore, blast furnace production, and steel making.
While completing this unit, the student will:
1. Describe the early art of smelting iron.
2. Explain the steps in the purification process.
3. Describe the blast furnace operation.
4. Tell how pig iron is converted into steel.

UNIT 3
The objective of this unit is to enable the student to understand how metals are produced; also to recognize and understand the properties of metallic ores: aluminum, copper, magnesium, nickel, titanium, and zinc.
While completing this unit, the student will:
1. Define and give examples of nonferrous metals.
2. Describe the ore dressing process.
3. Identify some common uses of aluminum, copper, magnesium, nickel, lead, tin, and zinc.

UNIT 4
The objective of this unit is to enable the student to measure the properties of metal; to test and measure, using dimensional and chemical measurements; and to test for defects.

III. COURSE CONTENT

B. PERFORMANCE OBJECTIVES FOR EACH UNIT, continued

While completing this unit, the student will:
1. Briefly explain the theory of spectrograph analysis.
2. List the four classifications of metal defects.
3. Name and describe three methods of non-destructive testing.
4. Cite the most common causes of structural failure in a metal.

UNIT 5
The objective of this unit is to enable the student to understand the structure of atoms, classification of elements, and the structure and crystallization of metals.
While completing this unit, the student will:
1. Describe the structure of an atom.
2. Explain the relationship of the orbit level, valence electrons, and chemical activity of an element.
3. Define crystallization and explain how it occurs.

UNIT 6
The objective of this unit is to enable the student to understand the concept of alloy system, solid solutions, solidification of pure metals and alloys, solid solution alloys, and iron-carbon alloys.
While completing this unit, the student will:
1. Define an alloy system.
2. Explain four factors which control the solubility of alloys.
3. State the function of a cooling curve and describe how it is used.
4. Define eutectic alloys.

UNIT 7
The objective of this unit is to help the student understand phase relationship, types of heat treatment, mechanics of cooling, hardenability and case hardening.
While completing this unit, the student will:
1. Describe the heat treatment processes of annealing, normalizing, hardening and tempering.
2. List common heat-treatable nonferrous alloys.
3. Name two methods used to increase a metal's hardenability.
4. List and describe the five most common methods of surface hardening.

UNIT 8
The objective of this unit is to enable the student to understand carbon-iron alloy metals, critical temperature of allotropic change, and heating and cooling changes.
While completing this unit, the student will:
1. Define hypo-eutectoid and hyper-eutectoid steels.
2. Describe the Cementite, Austenite, Ferrite, and Pearlite structures of iron-carbon alloys.
3. Compare gray, white, chilled, malleable, nodular, and alloy cast irons.
4. Describe the effects on cast iron of chromium, molybdenum, nickel, and sulfur.

B. PERFORMANCE OBJECTIVES FOR EACH UNIT, continued

UNIT 9
The objective of this unit is to enable the student to understand alloy elements in steels, types of alloy steels, stainless steels, tool steel alloys and their selection.
While completing this unit, the student will:
1. Identify the prime function of an alloy element in steel.
2. Briefly describe the basic purpose of the most common alloying elements.
3. Explain the AISA system for alloys.
4. List the five classes of tool steels.

UNIT 10
The objective of this unit is to enable the student to understand the properties and manufacturing processes of aluminum, copper, nickel, magnesium, and titanium alloys.
While completing this unit, the student will:
1. Describe some properties of the major aluminum alloys.
2. Know the differences between heat-treatable and nonheat-treatable aluminum alloys.
3. Explain the purpose for aluminum alloy surfaces coating.
4. Describe some common titanium alloys.

UNIT 11
The objective of this unit is to review the metal manufacturing processes.
While completing this unit, the student will:
1. Describe the sand casting and die casting processes.
2. Explain the hot and cold working processes.
3. Describe the various welding and brazing processes.
4. Describe the four basic types of power-driven machine tools.

IV. REFERENCE MATERIALS

Basic Metallurgy, Donald V. Brown, Delmar Publishers, Inc., ISBN 0-8273-1769-7.

V. SUPPLIES

Looseleaf notebook, paper, pens, pencils.

VI. GRADING STRUCTURE

90 - 100 = A
80 - 89 = B
70 - 79 = C
60 - 69 = D
0 - 59 = F

Chapter quizzes	=	40%
Homework assignments	=	10%
Laboratory projects	=	20%
Final Exam	=	30%

VII. ATTENDANCE POLICY

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Texas State Technical College Sweetwater

INSTRUCTIONAL SUPPORT

COURSE SYLLABUS

TITLE METHODS PROCESSING

NUMBER MTC 1323

LEC 2 LAB 3 CREDIT 3

PREREQUISITE: MTC 1123 - Manufacturing Processes

PREPARED BY: Tom J. Beck

APPROVED BY: Bill Barnes

DATE: September 8, 1992

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY:	DATE:

I. COURSE DESCRIPTION (Catalog Description)

This course provides a practical experience in the processing and time evaluation for manufacturing and assembly of components. Purchasing will be included.

II. COURSE OBJECTIVE (The Terminal Objective of the Course)

To familiarize the student with methods processing including Process Sheets, set-up times, cutting times, machine selection, inspection requirements and tolerance allocation.

III. COURSE OUTLINE

A. CONTENT - UNITS

1.0 Process Planning

- 1.1 The Process Planner (Requirements)
- 1.2 Economic Implications

2.0 Part-Print Analysis

- 2.1 Make-or-Buy Decisions
- 2.2 Raw-Material Selection
- 2.3 Product Drawing Analysis

3.0 Establishing the Sequence of Processes

- 3.1 Traditional Process Sequences
- 3.2 Process Elimination
- 3.3 In-Process Operations

4.0 Types and Functions of Jigs and Fixtures

- 4.1 Jigs and Fixtures
- 4.2 Types of Jigs
- 4.3 Types of Fixtures
- 4.4 Classification of Fixtures

5.0 Supporting and Locating Principles

- 5.1 Referencing
- 5.2 Basic Rules for Locating
- 5.3 Planes of Movement
- 5.4 Locating the Work

6.0 Clamping and Workholding Principles

- 6.1 Workholders
- 6.2 Basic Rules of Clamping
- 6.3 Types of Clamps
- 6.4 Special Clamping Considerations
- 6.5 Clamping Accessories

7.0 Basic Construction Principles

- 7.1 Tool Bodies
- 7.2 Preformed Materials
- 7.3 Drill Bushings
- 7.4 Set Blocks
- 7.5 Fastening Devices

8.0 Design Economics

- 8.1 Design Economy
- 8.2 Economic Analysis
- 8.3 Comparative Analysis

9.0 Developing the Initial Design

- 9.1 Predesign Analysis
- 9.2 Designing Around the Human Element
- 9.3 Previous Machining Operations
- 9.4 Developing Tooling Alternatives
- 9.5 Notetaking

10.0 Tool Drawings

- 10.1 Tool Drawings Versus Production Drawings
- 10.2 Simplified Drawings
- 10.3 Making the Initial Drawing
- 10.4 Dimensioning Tool Drawings
- 10.5 Millimeter and Inch Dimensioning
- 10.6 Geometric Dimensioning and Tolerancing
- 10.7 Geometrically Dimensioned and Toleranced Tool Drawings
- 10.8 Computers in Tool Design

11.0 Template Jigs

- 11.1 Template Jigs
- 11.2 Variations of Template Jigs
- 11.3 Design Procedures

12.0 Vise-Held and Plate Fixtures

- 12.1 Vise-Held Fixtures
- 12.2 Designing a Vise-Held Fixture
- 13.3 Plate Fixtures
- 13.4 Designing a Plate Fixture
- 13.5 Calculating Cam Clamps

13.0 Plate Jigs

- 13.1 Plate Jigs
- 13.2 Designing a Plate Jig
- 13.3 Designing a Table Jig
- 13.4 Designing a Sandwich Jig or a Leaf Jig

14.0 Angle-Plate Jigs and Fixtures

- 14.1 Variations and Applications

14.2 Designing an Angle-Plate Jig
14.3 Designing an Angle-Plate Fixture

15.0 Economic Processing Considerations

15.1 Machine Selection
15.2 Break-Even Charts
15.3 Payback Comparison
15.4 Existing Machinery; Machinery Comparison
15.5 Tooling Costs
15.6 Production Rates

16.0 Process Documentation

16.1 Release Authority
16.2 Cost Estimate Transmittal
16.3 Routing (Tolerance Chart)
16.4 Operation Sheet
16.5 The Design Work Order

17.0 Tolerance Charting

17.1 Preliminary Steps
17.2 Chart Preparation

18.0 Computer-Aided Process Planning

18.1 Group Technology
18.2 Variant and Generative Process Planning

19.0 Project Management

19.1 The Project
19.2 Management (Critical Path)

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

UNIT 1. The objective of this unit is to acquaint the student with methods processing where the method of processing is devised for the manufacture and testing of a product.

While completing this unit the student will:

A. Develop an understandng of Process Planning, including applied knowledge, specialization and education required.

B. Become aware of the economic implications in methods processing.

UNIT 2. The objective of this unit is to enable the student to do Part-Print Analysis, including estimated sales data and special customer considerations.

While completing this unit the student will:

A. Understand how to conduct Make-Buy decisions through economic analysis.

B. Learn the technique of selecting raw material for making the part.

C. Discuss how to recognize critical and difficult dimensions and how Engineering Change Proposals are generated and routed for approval.

D. Understand tolerance allocations through tolerance charting.

UNIT 3. The objective of this unit is to enable the student to learn to sequence the manufacturing process to allow the best and most economic method of manufacture for a given set of machinery and equipment.

While completing this chapter the student will:

A. Become familiar with the traditional Process sequence.

B. Understand the importance of doing the Process Plan correctly the first time.

UNIT 4. The objective of this unit is to enable the student to understand the purpose and importance of proper tool design and implementation in the process effort.

While completing this chapter the student will:

A. Discuss the objectives of tool design.

B. Identify the source of specified design data.

UNIT 5. The objective of this unit is to give the student experience in working with jigs and fixtures and an understanding of their uses.

While completing this chapter the student will:

A. Identify the classes and types of jigs and fixtures.

B. Chose a class and type of jig or fixture for selected operations on sample parts.

UNIT 6. The objective of this unit is to familiarize the student with clamping and workholding principles.

While completing this chapter the student will:

A. Explain the basic principles of workholding.

B. Identify the types of workholding devices.

C. Match the characteristics and applications to a particular type of clamping device.

UNIT 7. The objective of this unit is to teach the student basic construction principles.

While completing this unit the student will:

A. Identify the characteristics of tool bodies.

B. Identify various drill bushings.

C. Describe the proper placement and clearance for drill bushings.

D. Identify common jig and fixture hardware.

UNIT 8. The objective of this unit is to enable the student to understand the some of the principles of tool design economics, and to be able to:

A. Identify and define the principles of design economy.

B. Complete an economic analysis of a tool design.

UNIT 9. The objective of this unit is to enable the student to develop the initial tool design and be able to:

A. Describe how designs are planned.

B. Explain the human factors involved in tool design.

C. Explain the safety factors involved in tool design.

UNIT 10. The objective of this unit is to explore the special requirements of tool drawings.

While completing this unit the student will:

A. Identify the types of tool drawings.

B. Specify methods to simplify tool drawings.

C. Understand geometrical tolerancing.

D. Specify the rules of metric dimensioning.

UNIT 11. The objective of this unit is to give the student an in-depth understanding of the design and construction of jigs and fixtures and enable the student to:

A. Analyze part data to determine suitable tool designs.

B. Specify loading and supporting methods for a sample part.

C. Design a suitable template jig for a sample part.

UNIT 12. The objective of this unit is to help the student to become familiar with vise-held and plate fixtures.

While completing this unit the student will:

A. Analyze part data to determine suitable tool designs.

B. Specify locating, supporting and clamping methods for specific parts.

C. Analyze requirements, calculate and design a cam-action clamp.

D. Design a suitable vise-held fixture.

UNIT 13. The objective of this unit is to familiarize the student with the analysis and design processes for plate-type jigs.

While completing this unit the student will:

A. Analyze part data to determine suitable jig types to perform specified tasks.

B. Design plate-type jigs to suit specified sample parts.

UNIT 14. The objective of this unit is to enable the student to understand angle-plate jigs and fixtures and to be able to:

A. Analyze parts data to determine suitable tool designs.

B. Design angle-plate jigs and fixtures.

UNIT 15. The objective of this unit is to enable the student to understand the economic processing considerations of machine selection, tooling costs and production costs, and to be able to:

A. Construct Break-Even Charts.

B. Estimate tool design and build time and costs estimates.

UNIT 16. The objective of this unit is to introduce the importance and types of Process documentation and enable the student to understand and generate this documentation.

While completing this unit the student will:

A. Explain the need for release authority.

B. Analyze an Engineering Change Proposal.

C. Generate an Operation Sheet for a given part.

D. Generate a Design Work Order.

UNIT 17. The objective of this unit is to enable the student to understand that tolerance charting is a systematic method for establishing proper in-process dimensions and tolerances on individual process sheets.

While completing this unit the student will:

A. Generate a process allowing process tolerances.

B. Generate a tolerance chart for a sample part.

UNIT 18. The objective of this unit is to enable the student to utilize computer-aided process planning and be able to:

A. Cite the three key elements upon which computer aided processing is built.

B. Utilize the grouping techniques in processing.

UNIT 19. The objective of this unit is to enable the student to understand project management requirements and be able to:

A. Generate a critical path of a project.

B. Determine alternatives to allow time and cost savings.

IV. REFERENCE MATERIAL

A. Process Planning, Mark A. Curtis. Wiley Publishers. ISBN 013-715772-X

B. Jig and Fixture Design, Edward G. Hoffman. Delmar Publishers. ISBN 0-8273-4441-4

C. Motion and Time Study, 8th Ed., Benjamin W. Niebel. Irwin Publishers. ISBN 0-256-06082-7

V. SUPPLIES

Loose Leaf Notebook
Paper
Pens
Pencils
Ruler

VI. GRADING STRUCTURE

90 - 100	= A
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Chapter quizzes:	= 40%
Homework Assignments	= 10%
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Texas State Technical College Sweetwater

INSTRUCTIONAL SUPPORT

COURSE SYLLABUS

TITLE COMPOSITES/PLASTICS

NUMBER MTC 1423

LEC 2 LAB 3 CREDIT 3

PREREQUISITE: MTC 1123

PREPARED BY: T. J. Beck

APPROVED BY: Bill Barnes

DATE: 9/15/92

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY:	DATE:

I. COURSE TITLE: COMPOSITES/PLASTICS

II. COURSE DESCRIPTION (Catalog Description)

A study of the fabrication processes, the materials, modeling, curing, casting and machining of metal and resin matrix systems products.

III. COURSE OBJECTIVE (The Terminal Objective of the Course)

To give the Manufacturing Engineering Technology student an in-depth understanding and practical experience in all aspects of the uses and manufacture of composites and plastics including costs and benefits, fabrication and assembly, testing, quality assurance, damage control and reapir, design and most recent developments in the industry.

IV. COURSE OUTLINE

A. CONTENT - UNITS

1.0 Basic Terms and Developments

- 1.1 Definition and Use of Composites
- 1.2 Advantages and Disadvantages
- 1.3 Historical Developments

2.0 Composite Matrix Materials

- 2.1 The Matrix
- 2.2 Polyester and Epoxy Resins
- 2.3 Polyimides and Polybenzimidazoles
- 2.4 Phenolics and Carbon Matrices
- 2.5 Thermoplastic Matrices
- 2.6 Metal and Ceramic Matrices

3.0 Composite Reinforcements

- 3.1 Fiber Reinforcments
- 3.2 Glass Fibers
- 3.3 Carbon/Graphite Fibers
- 3.4 Organic Fibers
- 3.5 Boron, Silicon Carbide, and Specialty Reinforcements
- 3.6 Fabrics and Other Reinforcement Forms
- 3.7 Particle and Whisker Reinforcements
- 3.8 Reinforcement/Matrix Interactions
- 3.9 Comparisons of Reinforcements

4.0 Mechanical Properties

- 4.1 Comparison With Other Materials
- 4.2 Environmental Effects
- 4.3 Test Considerations

5.0 Manufacturing Methods

- 5.1 Manual Lay-Up (Wet and Prepreg)
- 5.2 Manufacture of Prepreg Materials
- 5.3 Automation Tape Lamination
- 5.4 Cutting of Uncured Composite Materials
- 5.5 Vacuum Bagging
- 5.6 Autoclave Cutting and Bonding
- 5.7 Filament Winding
- 5.8 Pultrusion
- 5.9 Matched-Die Molding
- 5.10 Resin-Transfer Molding (RTM)

- 5.11 Spray-Up Methods
- 5.12 Thermoplastic Processing Techniques
- 5.13 Curing of Thermosets
- 5.14 Tooling

6.0 Fabrication and Assembly

- 6.1 Cutting, Drilling, Machining of Cured Materials
- 6.2 Adhesive and Mechanical Joining of Composites
- 6.3 Sandwich Construction
- 6.4 Painting and Coating Composite Materials

7.0 Testing and Quality Assurance

- 7.1 Testing of Bare Fibers
- 7.2 Testing of Matrix Resins
- 7.3 Cured Laminate Quality Testing
- 7.4 Cured Laminate Mechanical Testing
- 7.5 Cured Laminate Environment Testing
- 7.6 In-Use and Failure Testing

8.0 Damage Control and Repair

- 8.1 Damage Causes and Prevention
- 8.2 Damage Detection and Assessment
- 8.3 Repair Procedures and Consequences

9.0 Composite Uses

- 9.1 Rockets and Missiles
- 9.2 Space Structures Applications
- 9.3 Aircraft Applications
- 9.4 Automotive and Truck Applications
- 9.5 Marine Applications
- 9.6 Sports Applications
- 9.7 Electrical Applications
- 9.8 Construction Applications
- 9.9 Other Applications

10.0 Installation, Set-Up and Operation of a Plastic Injection Molding Machine

B. PERFORMANCE OBJECTIVES

UNIT 1 The objective of this unit is to acquaint the student with the basic terms, historical developments, recent uses in industry, and advantages and disadvantages of using plastics and composites.

While completing this unit the student will:

A. Understand how composites and plastics differ from each other and from other materials.

B. Identify some of the uses of plastics and composites.

C. Discuss advantages and disadvantages of plastics and composites over other materials, and how the disadvantages can be overcome.

UNIT 2 The objective of this unit is to introduce types of matrices used in composites, their structure and purpose including polyester resins and polymides, phenolics and carbon matrices, thermoplastic, ceramic and metal matrices.

While completing this unit the student will:

A. Understand the purpose of a matrix in a composite, and the appropriate conditions for use of each matrix type.

B. Identify the chemical structure of the major types of matrices.

C. Discuss the properties of composites which are chiefly matrix dependent.

D. Illustrate the mechanism and structures resulting from condensation polymerization.

UNIT 3 The objective of this unit is to enable the student to understand the uses and manufacture of reinforcing agents used in composites.

While completing this unit the student will:

A. Understand the differences and similarities in major types of reinforcements used in composite structures.

B. Identify the principal uses for each of the major types of reinforcements.

C. Describe the principal methods for manufacturing reinforcements.

D. Evaluate the relative merits of the different types of reinforcements.

UNIT 4 The objective of this unit is to familiarize the student with the properties of composites: mechanical, physical, and thermal, and to show the student how to recognize, evaluate and use these properties.

While completing this unit the student will:

A. Recognize some of the basic differences in properties of composite materials that distinguish them from metals.

B. Understand the various design techniques and advantage of using composites to obtain high performance and highly efficient structures.

C. Describe the effects of the specific use environment on the behavior of composite materials for a range of operational conditions.

D. Set up various tests and approaches for evaluating and characterizing properties.

UNIT 5 The objective of this unit is to enable the student to understand the various manufacturing methods used in making composites and plastics, thermosets and thermoplastics.

While completing this unit the student will:

A. Identify the major manufacturing methods for composites and discuss their use.

B. Discuss the advantages and disadvantages of each of the major manufacturing methods.

C. Contrast and compare the manufacturing methods for thermosets and for thermoplastics.

D. Identify areas of work for improvements in the composite manufacturing methods.

UNIT 6 The objective of this unit is to enable the student to demonstrate methods for fabricating and assembling plastics and composites.

While completing this unit the student will:

A. Apply proper techniques for joining and separating composites, adhesive bonding, sandwich construction, and painting and coating composite materials.

B. Be aware of the basic problems and some of the methods for solving these problems in cutting, machining, and drilling of cured composites.

UNIT 7 The objective of this unit is to familiarize the student with the common methods of testing composite materials and predicting their behavior.

While completing this unit the student will:

A. Be familiar with the most common methods for testing composite materials.

B. Understand the advantages and disadvantages of each of the major tests and the appropriate use of these tests.

C. Understand the tests and methods that determine the quality of incoming materials and finished parts for composites.

D. Discuss the function of failure analysis for composites and the tests which are used for failure analysis.

UNIT 8 The objective of this unit is to instruct the student in the detection and repair of damage to composite structures.

While completing this chapter the student will:

A. Identify and discuss the most common causes of damage for composite structures.

B. Identify and evaluate several methods for preventing damage from the typical damage sources.

C. Discuss the common methods of damage detection and assessment.

D. Describe and demonstrate the principal methods for damage repair.

E. Identify the major problems which are encountered in composite repairs.

UNIT 9 The objective of this unit is to enable the student to apply his technical knowledge to an appreciation for new uses for composites and plastics.

While completing this unit the student will:

A. Identify several major application areas for composites and plastics.

B. Discuss the use of composites in several specific applications and point out advantages and disadvantages in those applications.

C. Understand the general principles on which use of composites is based so that new application areas might be anticipated.

UNIT 10 The objective of this unit is to familiarize the student with thermosetting and thermoplastic materials and their molding methods.

While completing this unit the student will:

A. Identify the four methods of molding.

B. Identify the general properties of a selected list of plastic materials.

C. Operate plastic injection molding machine.

V. REFERENCE MATERIAL

Fundamentals of Composites Manufacturing: Materials, Methods and Applications, Dr. A. Brent Strong. Society of Manufacturing Engineers. ISBN 0-87263-358-6

VI. SUPPLIES

Loose Leaf Notebook
Paper
Pens
Pencils
Ruler

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60 - 69	= D
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Texas State Technical College Sweetwater

INSTRUCTIONAL SUPPORT

COURSE SYLLABUS

TITLE STATICS

NUMBER MTC 2173

LEC 3 LAB 3 CREDIT 4

PREREQUISITE: Math 114, Math 124

PREPARED BY: T. J. Beck

APPROVED BY: Bill Bowen

DATE: 9-15-92

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY:	DATE:

I. COURSE TITLE: MTC 2173 STATICS

II. COURSE DESCRIPTION (Catalog Description)

This course is a study in the composition and resolution of forces, the equilibrium of forces acting on structures and machines, It includes friction, moments, couples, centroids, moments of inertia and section modulus.

III. COURSE OBJECTIVE:

To enable the student to recognize static force applications in the industrial environment; to teach use of correct physical and mathematical principles to solve static force problems. Both calculator and computers will be used.

IV. COURSE OUTLINE

A. CONTENT - UNITS

1.0 Fundamental Terms

- 1.1 Introduction to Mechanics
- 1.2 Basic Terms
- 1.3 Introduction to Metrics
- 1.4 Vectors and Scalars
- 1.5 Numerical Accuracy
- 1.6 Rounding Off Numbers
- 1.7 Dimensional Analysis

2.0 Resultant and Equilibrant of Forces

- 2.1 Definitions
- 2.2 Types of Force Systems
- 2.3 Resultant of Concurrent Force Systems
- 2.4 Resultant of Collinear Forces
- 2.5 Equilibrium of Concurrent Force Systems
- 2.6 Equilibrium of Collinear Forces
- 2.7 Action and Reaction
- 2.8 Tension and Compression: Two Force Members
- 2.9 Resultant of Two Concurrent Forces
- 2.10 Equilibrant and the Force Triangle
- 2.11 Principle of Concurrence
- 2.12 Methods of Solution
- 2.13 Free Body
- 2.14 Analysis of a Simple Structure (Pinned Joints)
- 2.15 Components of a Force
- 2.16 Rectangular Components of a Force
- 2.17 Inclined Plane
- 2.18 Resultant of More Than Two Forces in a Plane
- 2.19 Equilibrium of More Than Two Forces
- 2.20 Resultant of Concurrent Forces by Summation
- 2.21 Equilibrium of Concurrent Forces

3.0 Moments of Force

- 3.1 Moments
- 3.2 Sign of Moments
- 3.3 Equilibrium of Parallel Forces
- 3.4 Uniformly Distributed Loads
- 3.5 Couples

9.0 Bolted, Riveted and Welded Joints and Thin-Walled Pressure Vessels

9.1 Introduction
9.2 Bolted Joints
9.3 Types of Failure in Bolted Joints
9.4 Stesses in a Bolted Joint
9.5 Terminology and Codes for Bolted Joints
9.6 Efficiency of a Bolted Joint
9.7 Bolted Joints of Maximum Efficiency
9.8 Riveted Joints
9.9 Welded Joints
9.10 Thin-Walled Pressure Vessels

B. PERFORMANCE OBJECTIVES:

UNIT 1. The objective of this unit is to enable the student to understand the definitions and relationships of mechanics, statics, dynamics, and strength of materials, and basic terms used in the study of statics.

While completing this unit the student will:

A. Define and give examples of basic terms: length, area, volume, force, pressure, mass, weight, density, load, moment, torque, work and power.

B. Memorize and be able to convert metric values to U.S. Customary System values and vice versa.

C. Understand and solve problems using vectors and scalers, and dimensional analysis.

UNIT 2. The objective of this unit is to enable the student to understand the concepts of forces and force systems through simple problem solving.

While completing this unit the student will:

A. Understand the difference between kinds of forces and force systems.

B. Solve simple problems for finding the resultant of colinear forces, magnitude and direction, force triangles, vectors, components of a force, inclined planes, equilibrium, and concurrent forces.

C. Sketch force vector diagrams and other geometrical illustrations of force problems.

UNIT 3. The objective of this unit is to enable the student to understand and measure Moments of a force, and solve problems for equilibrium of parallel forces, uniformly distributed loads, and couples.

While completing this unit the student will:

A. Define and give examples of Moments of Force, both positive and negative.

B. Solve problems of parallel forces, uniformly distributed loads and couples.

C. Sketch simple geometrical illustrations showing force principles in problems of Moments.

UNIT 4. The objective of this unit is to enable the student to understand and apply principles of nonconcurrent-coplanar forces and trusses to practical problems.

While completing this unit the student will:

A. Define and give examples of Nonconcurrent-coplanar forces and trusses.

B. Solve problems for nonconcurrent-coplanar forces using algabraic and graphical methods.

C. Solve truss problems using the method of joints and the method of sections.

UNIT 5. The objective of this unit is to enable the student to understand and apply the principles of concurrent-noncoplanar forces to solving problems of weight and tension.

While completing this unit the student will:

A. Use trigonometric or algebraic methods to find the resultant of concurrent-noncoplanar forces, angles of force.

B. Sketch simple geometrical illustrations showing force principles in problems of weight and tension.

UNIT 6. The objective of this unit is to introduce the student to the concepts of static and kinetic friction, and to solve problems using the principles of these concepts.

While completing this unit the student will:

A. Understand and define the principles of static and kinetic friction.

B. Solve problems of static or kinetic friction on a level plane, an inclined plane and a rough plane.

C. Understand and solve problems using the cone of friction, the principle of wedge action, journal friction, and jackscrew.

D. Sketch simple geometrical illustrations showing force principles in problems of static and kinetic friction.

UNIT 7. The objective of this unit is to introduce the concept of Stress, and to enable the student to define, illustrate and solve problems for finding simple (direct), indirect and combined stresses.

While completing this unit the student will:

A. Understand and define types of stresses.

B. Determine simple stresses under direct loading conditions.

C. Determine average stress.

D. Determine acceptable tensile loads and material strength when the stress is given.

UNIT 8. The objective of this unit is to relate the problems of statics to the properties of materials to enable students to understand the effects of various stresses on materials and to recognize conditions resulting from these.

While completing this unit the student will:

A. Identify and define the tests used to determine stresses in materials including tension test.

B. Plot stress and strain, given a type of material and initial physical data.

C. Determine elasticity, ductility, allowable stresses, and margin of safety in materials under stress.

D. Determine thermal expansion and thermal stress on materials.

E. Determine stresses on members composed of two materials in parallel and two materials in series.

UNIT 9. The objective of this unit is to enable the student to relate the various types of assembly--bolts, rivets and welds--and their failure modes to the problems of statics.

While completing this unit the student will:

A. Explain the types of bolted joints, their failure modes, and terminology including ASME code system.

B. Determine acceptable loads on bolted joints, given a description of the materials and their dimensions.

C. Determine the efficiency of bolted joints, riveted joints, and welded joints, using AISC Coding.

D. Discuss the special failure modes of thin-walled vessels and calculate the stresses which can cause these failures; calculate stresses on the transverse section of these vessels.

V. REFERENCE MATERIAL

Statics and Strength of Materials, 4th Edition, Bassin, Brodsky & Wolkoff. McGraw-Hill Publishers.

VI. SUPPLIES

Calculator
Loose Leaf Notebook
Paper
Pens
Pencils
Ruler

VII. GRADING STRUCTURE

90 - 100	= A
80 - 89	= B
70 - 79	= C
60 - 69	= D
0 - 59	= F

Chapter quizzes:	= 40%
Homework Assignments	= 10%
Laboratory Projects	= 20%
Final Exam	= 30%

VIII. ATTENDANCE POLICY

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TSTI SWEETWATER

Texas State Technical Institute
Instructional Support

COURSE SYLLABUS

TITLE Management I

NUMBER MIT 1104

LEC 3 LAB 3 CREDIT 4

PREREQUISITE: None

PREPARED BY: Jerry Frederick

APPROVED BY: Jerry Frederick

DATE: November, 1990

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: Bill Barnes DATE: 12-4-90

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TSTI SWEETWATER

Texas State Technical Institute

COURSE SYLLABUS

I. COURSE DESCRIPTION (Catalog Description)

Managerial decision making procedures within the retail organization in relation to employee training, utilization and other problems will be discussed.

II. COURSE OBJECTIVE (The Terminal Objective of the Course)

This course provides an introduction to the fundamentals of industrial management and its influence on productivity. Upon completion of the course, the student will have been introduced to and have an understanding of:

1. Basic management challenges in Decision Making and Problem Solving
2. Planning for Productivity
3. Organizing for Productivity
4. Leading for Productivity
5. Controlling for Productivity

III. COURSE OUTLINE

A. CONTENT - Units

1.0 Introduction
- 1.1 Managers, Management and Productivity
- 1.2 Historical Perspectives on Management
- 1.3 Management Decision Making and Problem Solving

2.0 Planning for Productivity
- 2.1 Fundamentals of Planning
- 2.2 Strategic Planning

3.0 Organizing for Productivity
- 3.1 Fundamentals of Organizing
- 3.2 Organizational Design
- 3.3 Designing Jobs for Individuals and Groups
- 3.4 Staffing the Human Resources

4.0 Leading for Productivity
- 4.1 Fundamentals of Leading
- 4.2 Leading through Communication
- 4.3 Leading through Motivation
- 4.4 Leading through Group Dynamics

5.0 Controlling for Productivity
- 5.1 Fundamentals of Controlling
- 5.2 Control and Management
- 5.3 Operations Management and Control

6.0 Productivity in the Contemporary Environment
- 6.1 Managing Innovation, Change and Conflict
- 6.2 Managing Labor-Management Relations
- 6.3 Managing with Social Responsibility

III. COURSE OUTLINE

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

B.1 The objective of this unit is to introduce the challenge of being a good manager, to introduce the history of management thought, and address the process of good decision making and problem solving. At the end of this unit, students will have acquired sufficient training to:

1.1 Define the managers function and describe the managers job in the organization.
1.2 Identify the organization, describe its purpose, its division from labor, and its authority hierarchy.
1.3 Explain the various managerial levels within the organization and outline the types of managers found in organizations.
1.4 Define productivity and discuss criteria for measurement of the managers success in the quest for productivity.
1.5 Explain the management process, list the four basic ingredients which make up the functions of management and to describe the nature of managerial work.
1.6 Categorize the essential skills required as a manager and to outline managerial competencies required to succeed as a manager.

2.1 Identify the three perspectives on management as an art, a science and as a profession.
2.2 Define the historical evolution of management thought.
2.3 Outline the three branches of the classical approach to management.
2.4 Summarize the theories and assumptions related to the behavioral approaches to management.
2.5 Demonstrate the techniques and applications of the quantitative approaches to management.
2.6 Identify and discuss the most useful insights of the other approaches and their convergence into the modern approaches to management.

3.1 Describe effective managerial problem solving and illustrate three approaches to problem solving.
3.2 Outline the steps in the problem solving process.
3.3 Explain the steps which must be followed for finding and identifying problems.
3.4 Select techniques for generating and evaluating alternative solutions.
3.5 Manipulate methods for choosing among the alternative solutions.
3.6 Implement the selected solution and evaluate the results.
3.7 Develop ideas for improving managerial problem solving.

B.2 The purpose of this section is to discuss in detail the first of the four basic managerial functions - Planning. This section will provide indepth discussions of the fundamentals of planning and an introduction to Strategic Planning. At the conclusion of this section, the student will have gained sufficient knowledge to:

4.1 Define planning as a management function and outline the requirements for effective planning.
4.2 Demonstrate the fundamental steps of the planning process.
4.3 Differentiate the plan from the planning objective.
4.4 Compare various types of plans used by managers.
4.5 Detail the planning process steps used in formal planning and demonstrate several different approaches to planning.
4.6 Manipulate the forecasting process and use it as a planning aid.
4.7 Categorize the limits and potential benefits of planning, illustrate ways to make planning more effective, and differentiate the types of planning which occurs at different management levels.

5.1 Identify and describe the steps in the strategic planning process.
5.2 Outline the major elements of the strategy formulation process.
5.3 Explain strategic planning models.
5.4 Discuss the keys to effective implementation of stretegic plans.

B.3 The purpose of this section is to discuss in detail the second of the four basic managerial functions - Organizing. This section will provide details on the fundamentals of organizing, organizational design, job design and human resource staffing. After completing this section, the student will be able to:

6.1 Define organizing and explain its importance as a management function.
6.2 Discuss the concept of organizational structure and the use of organizational charts to depict structure.
6.3 Explain the properties of the three types of departmentation - functional, divisional & matrix.
6.4 Identify means by which managers achieve vertical coordination.
6.5 Identify means by which managers achieve horizontal coordination.
6.6 Discuss the factors which influence the appropriate system of control.

7.1 Define the concept and practice of organizational design.
7.2 List and explain the bureaucratic features of organizations.
7.3 Identify and discuss the various forms of mechanistic and organic organizations.
7.4 Explain the influence of information processing requirements on organizational design.

7.5 Identify the influence of internal and external elements on organizational design.
7.6 Define differentiation and integration and explain their role in subsystem design.

8.1 Discuss the meaning of work, and its significance on the quality of life.
8.2 To provide discussion of jobs, job descriptions, job satisfaction and job performance and their relationships.
8.3 Identify and explain strategies and procedures for job design, job simplification, job rotation, job enlargement and job enrichment.
8.4 Diagram a detailed diagnostic approach to job enrichment.
8.5 Identify and explain the concept of alternative work schedules, compressed work week, flexible hours, job sharing, work-at-home and part-time work.

9.1 Define and explain the staffing processes.
9.2 Develop plans and procedures for analyzing and identifying needs for personnel and explain the importance of human resource planning.
9.3 Describe in detail the process for recruitment of qualified candidates.
9.4 List the steps for selection of the best applicants meeting the job specifications.
9.5 Explain the importance of orientation of new people joining the organization.
9.6 Detail the procedures for step by step intensive training and develop means to improve the skills of management personnel.
9.7 Describe in detail the procedure for removal of a person from an assigned job, the replacement process and the various situations leading to the need for replacement.

B.4 The purpose of this section is to discuss in detail the third of four basic managerial functions - Leading. This section will provide the fundamentals of leading, leading through communications, leading through motivation, and leading through group dynamics. Upon completion the student will be able to:

10.1 Define the two major leadership concepts
10.2 Discuss power as a leadership resource, the sources of that power and the limits to power
10.3 Outline the history of the study of leadership and discuss current leadership styles.
10.4 Explain the theories of leadership effectiveness.
10.5 Discuss the current directions in leadership.

11.1 Identify and discuss the importance of communication and its implications on managerial roles and functions.
11.2 Explain communication as an interpersonal process.
11.3 List the barriers to effective communication.
11.4 Discuss perception and the way information is interpreted and its affect on effective communication.
11.5 Outline the formal and informal channels of upward, downward and lateral organizational communication.
11.6 Describe the guidelines for effective communications including rules of good listening and the commandments of good communication.

12.1 Describe the concept of motivation.
12.2 Discuss motivation and rewards and their effect on performance.
12.3 Present various theories related to needs and the managerial implications of individual needs.
12.4 Describe the Equity Theory of rewards and motivation.

12.5 Describe the Expectancy Theory of work motivation.
12.6 Explain the Goal-Setting Theory approach to motivation.
12.7 Outline the Reinforcement Theory of human behavior and motivation.

13.1 Identify and discuss all the types of group forms found within organizations.
13.2 Describe groups effectiveness, group development and group dynamics.
13.3 Describe the norms and cohesiveness of groups and their influence on behavior.
13.4 Explain group task and maintenance activities and their contribution to group performance.
13.5 Outline process for systematic team building.
13.6 Present examples of intergroup competition and approaches for managing that competition.

B.5 The purpose of this section is to discuss the fourth of four basic managerial functions - Controlling. This section will provide the fundamentals of controlling, a discussion of control and MIS, operations management, resource planning and cost control. After completing this section, the student will be able to:

14.1 Describe Control as a management function, list the elements of the control process and discuss the importance of controlling.
14.2 Identify the essential components of organizational control systems.
14.3 Outline the performance appraisal systems and various methods used by managers to appraise individual performance.
14.4 Explain the design and implementation of Compensation and Benefit systems.
14.5 Describe two approaches to employee discipline and outline guidelines for disciplinary action.
14.6 Define and describe the technique of Management By Objectives and describe the pros and cons of MBO.

14.7 Present potential human reactions to controls and describe ways management can make controls effective.

15.1 Describe various forms of management information and discuss its impact on management control.
15.2 Define Management Information Systems (MIS), its components and evolution.

16.1 Define Operations Management and discuss its effect on organizations.
16.2 Outline the utilization of technology in operations management development.
16.3 Identify the role of the human factor in socio-technical systems.
16.4 Define resource planning and control and identify MRP, MRP II, JIT, Project Management, Gantt Charts, PERT, CPM & EOQ methods of resource planning and control.

IV. REFERENCE MATERIAL

Management for Productivity 3rd Edition
John R. Schermerhorn, Jr.

V. SUPPLIES

Loose Leaf notebook
Paper
Spiral notebook
Pens
Pencils

VI. GRADING PROCEDURE

90 - 100 = A
80 - 89 = B
70 - 79 = C
60 - 69 = D
0 - 59 = F

1.	Homework & Chapter Quizzes	= 20%
2.	Case Studies	= 20%
3.	Unit Tests	= 40%
4.	Final Exam	= 20%

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Texas State Technical College Sweetwater

INSTRUCTIONAL SUPPORT

COURSE SYLLABUS

TITLE COST CONTROL & ESTIMATING

NUMBER MTC 2223

LEC 2 LAB 3 CREDIT 3

PREREQUISITE: MTC 1123 - MANUFACTURING PROCESSES

PREPARED BY: Tom Beck

APPROVED BY: Bill Barnes

DATE: 9-15-92

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY:	DATE:

I. COURSE TITLE: MTC 2223 COST CONTROL AND ESTIMATING

II. COURSE DESCRIPTION (Catalog Description)

This course is a practical study of the elements of profit-planning data and applying direct-cost-machine-hour rate systems. Prerequisite: MTC 1123

III. COURSE OBJECTIVE (Terminal Objective of the Course)

To enable the student to understand the control, organization, function and procedures of cost estimating. Computer estimating software and applications are introduced. The techniques used in determining direct labor, material, factory burden, tooling, and selling costs will be practiced and refined. The student will the problems associated with a high or low bid, and the effect of either on a company.

IV. COURSE OUTLINE

A. CONTENT - UNITS

1.0 The Estimating Function

- 1.1 Importance of Cost Estimating
- 1.2 Difference Between Cost Estimating and Cost Accounting
- 1.3 How Cost Estimating is Used
- 1.4 Preliminary and Final Estimates

2.0 Organizing and Staffing for Estimating

- 2.1 Importance of Team Planning
- 2.2 Role of Industrial Engineering Department
- 2.3 Role of the Accounting Department
- 2.4 Role of the Estimating Team Coordinator

3.0 Cost Estimating Controls

- 3.1 Overal Function of Administrative Control
- 3.2 Cost Estimate as Indicator of Manufacturing Feasibility
- 3.3 Importance of Good Organization of Data
- 3.4 Danger of Both High and Low Estimates

4.0 Estimating Procedures

- 4.1 Variations of Estimating Procedures
- 4.2 Generating a Bill of Materials
- 4.3 Analyzing the Estimate Request
- 4.4 Analyzing the Product Drawing
- 4.5 Developing the Manufacturing Process
- 4.6 Computing Costs of Material and Tooling
- 4.7 Estimating Manufacturing Labor Time

5.0 Computer Applications

- 5.1 Advantages of Using the Computer for Cost Estimating
- 5.2 Precautions in Computer Based Cost Estimating
- 5.3 Using a PC-Based Cost Estimating Program

6.0 Estimating Die Casting Machining Costs

- 6.1 Preparing a Time Study
- 6.2 Calculating Machining Time for Manufacturing Operations

7.0 Estimating Machining Costs for an Aluminum Forging

- 7.1 Profitability Study
- 7.2 Other Related Analysis
- 7.3 Compiling Costs: Blank Forging, Anodizing, Labor for Machinery Handling and Burden.

8.0 Screw Machine Cost Estimating

- 8.1 Selecting the Raw Stock
- 8.2 Planning the Cutting Sequence
- 8.3 Determining Proper Spindle Speeds and Feed Rates
- 8.4 Overlapping Operations
- 8.5 Calculating Labor Time Per Part

9.0 Estimating Sand Casting Costs

- 9.1 Sand Casting Costs
- 9.2 Allowing for Loss During Operation
- 9.3 Determining Cost Per Pound

10.0 Estimating Welding Costs

- 10.1 Laying Out a Welding Process Plan
- 10.2 Welding Tooling Costs
- 10.3 Direct Material Costs
- 10.4 Direct Labor Costs
- 10.5 Quality Control Costs
- 10.6 Burden Costs

11.0 Estimating Forged Parts

- 11.1 General Groups of Forgings
- 11.2 Calculating Allowances for Waste
- 11.3 Using Estimator Charts for Per-Hour Costs

12.0 Estimating Metal Stamping Costs

- 12.1 Selecting Economical Piece Part Materials
- 12.2 Comparing Costs Using Compound Die or Separate Dies

13.0 Estimating Plastic Parts

- 13.1 Estimating Tooling Costs and Cycle Times
- 13.2 Calculating Speeds and Feeds and Machinery Times

14.0 Estimating Tumbling and Vibratory Finishing Costs

- 14.1 Floor Space, Depreciation and Equipment Maintenance Costs
- 14.2 Calculating Power, Abrasive and Labor Costs in Tumbling and Vibratory Finishing

15.0 Estimating Multipurpose Jigs and Fixtures

- 15.1 Determining Costs of Single-Purpose and Multi-Purpose Tools
- 15.2 Calculating Changeover costs Associated with Multi-Purpose Tools

B. PERFORMANCE OBJECTIVES:

UNIT 1. The objective of this unit is to acquaint the student with the estimating function.

While completing this unit the student will:

A. Learn why cost estimating is critical to the success of any company.

B. Understand the difference between cost estimating and cost accounting.

C. List at least four ways cost estimating is used in industry.

D. Calculate the cost of a unit considering the learning curve.

E. Tell the requirements and differences between a preliminary product cost estimate and a final (detailed) cost estimate.

UNIT 2. The objective of this unit is to introduce the student to the organizational aspects of cost estimating, both as a coordinated function and as a separate entity.

While completing this unit the student will:

A. Understand the advantages of team participation in cost estimating: better technology and more commitment.

B. Describe the role of the Industrial Engineer in the cost estimating.

C. Describe the role of the Accounting Department in cost estimating.

D. Describe the role of the Estimating Team Coordinator in cost estimating.

UNIT 3. The objective of this unit is to enable the student to appreciate and practice the administrative controls necessary in the cost estimating process.

While completing this unit the student will:

A. Understand the phases of administrative control beginning with monitoring the incoming request and continuing until the cost estimate is finalized.

B. Describe the relationship between cost estimate and feasibility of manufacturing the product.

C. Understand the importance of assembling standard data in well organized files.

D. List several reasons why both unrealistically low or high estimates will adversely affect a company's manufacturing effort.

C. Sketch simple geometrical illustrations showing force principles in problems of Moments.

UNIT 4. The objective of this unit is to enable the student to apply principles of cost estimating.

While completing this unit the student will:

A. Describe the various differences in companies which affect the considerations in a cost estimate.

B. Generate a Bill of Materials and understand its purpose.

C. Analyze the estimate request and product drawings to develop the manufacturing process, compute materials costs, tooling costs and estimate manufacturing labor time for each operation.

D. Apply labor and burden rates to each operation.

UNIT 5. The objective of this unit is to familiarize the student with several different software cost-estimating programs available for use on the personal computer.

While completing this unit the student will:

A. Understand the advantages of using a computer to estimate manufacturing costs.

B. Learn the precautions to observe when using a computer for cost estimating.

C. Use a personal computer and cost estimating software to perform cost estimating operations.

UNIT 6. The objective of this unit is to enable the student to generate die-cast part machinery cost estimates.

While completing this unit the student will:

A. Understand and apply the principles of Standard Data for a time study and compile a time study operation sheet.

B. Calculate the machining time for milling, drilling and reaming operations.

UNIT 7. The objective of this unit is to enable the student to estimate machining costs for an aluminum forging.

While completing this unit the student will:

A. Practice the procedure followed by the sales department in studying the request in terms of profitability.

B. Practice the procedure followed by the Estimating Coordinator in analyzing the request for all the necessary information.

C. Calculate blank forging costs, anodizing or other refinishng costs, labor for machining and handling, and burden costs.

UNIT 8. The objective of this unit is to enable the student to estimate costs for a screw machine operation.

While completing this unit the student will:

A. Identify how to select the raw stock based on outer diameter stresses.

B. Plan the cutting sequence.

C. Determine proper spindle speeds, feed rates, and whether operations can be overlapped.

D. Calculate labor time per part.

UNIT 9. The objective of this unit is to enable the student to estimate costs for a sand casting operation.

While completing this unit the student will:

A. Understand the types of costs associated with sand casting: material, foundry tooling, molding costs, core costs, machining and cleaning costs, heat treatment, inspection and foundry burden costs.

B. Estimate anticipated material losses such as metal loss due to oxidation spills overruns and gate cutoff.

C. Determine the cost per pound from recent foundry history.

UNIT 10. The objective of this unit is to teach the student how welding costs are estimated.

While completing this unit the student will:

A. Lay out a welding process plan.

B. Estimate welding tooling costs.

C. Estimate welding material costs.

D. Estimate direct labor costs.

E. Estimate quality control costs.

F. Apply burden costs.

UNIT 11. The objective of this unit is to enable the student to make a cost estimate on forged parts.

While completing this unit the student will:

A. List the four general groups of forgings (smith, drop, machine, and press).

B. Calculate the allowances for scale, tonghold, flash, sprue and cut waste.

C. Use estimator charts to calculate machine, furnace, trim press and operator costs per hour.

UNIT 12. The objective of this unit is to teach the student how to estimate metal stamping costs.

While completing this unit the student will:

A. Select the most economical coil or strip for a particular piece part.

B. Compare total costs of making a part from one compound die or from three separate dies.

UNIT 13. The objective of this unit is to enable the student to estimate the costs of manufacturing plastic parts.

While completing this unit the student will:

A. Estimate tooling costs and cycle times for molding the part.

B. Calculate drilling, turning and milling speeds and feeds to estimate machining times.

UNIT 14. The objective of this unit is to enable the student to estimate the costs of tumbling and vibratory finishing.

While completing this unit the student will:

A. Estimate costs based on floor space depreciation and maintenance of equipment.

B. Estimate power, abraseive and labor costs in tumbling and vibratory finishing.

UNIT 15. The objective of this unit is to enable the student to estimate cost of multipurpose jigs and fixtures.

While completing this unit the student will:

A. Compare the costs of single-purpose and multipurpose tools.

B. Calculate the chageover costs associated with multipurpose tools.

V. REFERENCE MATERIAL

Realistic Cost Estimating for Manfacturing, 2nd Edition, William Winchell. Society of Manufacturing Engineers. ISBN 0-87263-364-0

VI. SUPPLIES

One 5-1/4 Inch floppy Disk
Calculator
Loose Leaf Notebook
Paper
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Ruler

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Texas State Technical College Sweetwater

INSTRUCTIONAL SUPPORT

COURSE SYLLABUS

TITLE STRENGTH OF MATERIALS

NUMBER MTC 2273

LEC 2 LAB 4 CREDIT 3

PREREQUISITE: MTC 2173 - STATICS

PREPARED BY: T. J. Beck

APPROVED BY: Bill Barnes

DATE: 9-15-92

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY:	DATE:

I. COURSE TITLE: MTC 2273 STRENGTH OF MATERIALS

II. COURSE DESCRIPTION (Catalog Description)

A problem-oriented study of strength of materials including relationships between loads placed on structural components, mechanical properties of materials used in the components, shape and size of components, resultant stresses in components and component deflections.

III. COURSE OBJECTIVE (The Terminal Objective of the Course)

To enable the student to calculate stress and strain in loaded components, to predict component life in cyclic loading. Both hand calculators and computers will be used.

IV. COURSE OUTLINE

A. CONTENT - UNITS

1.0 Center of Gravity, Centroids and Moment of Inertia

- 1.1 Center of Gravity of a Body
- 1.2 Center of Gravity of a Area--Centroid
- 1.3 Moment of an Area
- 1.4 Centroids of Composite Areas
- 1.5 Center of Gravity of Simple Solids
- 1.6 Areas and Volumes--Centroid Method
- 1.7 Moment of Inertia
- 1.8 Transfer Formula
- 1.9 Moments of Inertia of Composite Areas

2.0 Beams--Shear Forces and Bending Moments

- 2.1 Types of Beams
- 2.2 Beam Theory
- 2.3 Shear-Force Diagram
- 2.4 Moment Diagram
- 2.5 Relations Among Beam Loading, Shear Diagram and Moment Diagram
- 2.6 Bending Moment From Shear-Diagram Area
- 2.7 Moving Loads

3.0 Beams--Design

- 3.1 Stress Due to Bending
- 3.2 Horizontal and Vertical Shear Stresses
- 3.3 Maximum Horizontal Shear Stress for Common Cross Sections
- 3.4 Maximum Vertical Shear Stress in S-Shape and W-shape Beams
- 3.5 Discussion of Beam Deflection
- 3.6 Radius of Curvature
- 3.7 Methods of Detrmining Deflection Formulas
- 3.8 Deflection of a Simply Supported Beam (Concentrated Load at Center)
- 3.9 Deflection of a Simply Supported Beam (Uniform Load)
- 3.10 Deflection of a Cantilever Beam (General)
- 3.11 Deflection of a Cantilever Beam (Concentrated Load at Free End)
- 3.12 Deflection of a Cantilever Beam (Concentrated Load at Any Point)
- 3.13 Deflection of a Cantilever Beam (Uniform Load)
- 3.14 Deflection of Beams With Combined Loads

3.15 Design of a Beam
3.16 Lateral Buckling

4.0 Torsion, Shafts, Shaft Couplings, and Keys

4.1 Torsion
4.2 Torsional Shearng Stress
4.3 Angle of Twist
4.4 Power of Transmission
4.5 Keys

5.0 Combined Stresses

5.1 Principle of Superposition
5.2 Combined Axial and Bending Stresses
5.3 Eccentrically Loaded Short Compression Members
5.4 Eccentric Loading of Machine Members
5.5 Eccentrically Loaded Bolt Joints
5.6 Shear Stress due to Tension or Compression
5.7 Mohr's Circle--Normal and Shear Stresses Due to Axial Load
5.8 Tension or Compression Due to Shear
5.9 Combined Bending and Torsion
5.10 Mohr's Circle--Combined Stress

6.0 Columns

6.1 Introduction
6.2 Slenderness Ratio
6.3 Radius of Gyration
6.4 Catagories of Columns
6.5 End Conditions
6.6 Column Formulas (Metals)
6.7 Column Formulas (Timber)

7.0 Indeterminate Beams

7.1 Types of Statically Indeterminate Beams
7.2 Beams With One End Fixed, One End Supported
7.3 Beam With Both Ends Fixed

8.0 Using Computer Programs To Calculate Problems of Stress

B. PERFORMANCE OBJECTIVES:

UNIT 1. The objective of this unit is to enable the student to understand center of gravity, centroids and moment of inertia.

While completing this unit the student will:

A. Calculate the center of gravity of a body and an area.

B. Determine the moment of an area and the centroid of a composite area.

C. Calculate the moment of inertia of simple areas and, by use of the transfer formula, composite areas.

UNIT 2. The objective of this unit is to enable the student to understand the principles involving loads and forces in beams, including shear forces and bending moments.

While completing this unit the student will:

A. Understand beam theory, stress, neutral axes of the sections, shear and bending forces.

B. Analyze the stresses in statically determinate and statically indeterminate beams.

C. Calculate and construct shear force diagrams and moment diagrams for beams with concentrated, uniform, or moving loads or any combination of these loads.

UNIT 3. The objective of this unit is to enable the student to analyze the reactions of a loaded beam.

While completing this unit the student will:

A. Calculate the maximum safe loads for selected beams.

B. Understand horizontal and vertical shear stresses.

C. Calculate maximum horizontal and vertical shear stresses for common cross-sections of beams.

D. Calculate deflections of various types with several types of loads.

UNIT 4. The objective of this unit is to enable the student to measure the stresses generated in shafts under torsional loading.

While completing this unit the student will:

A. Calculate torsional strain in a shaft.

B. Find the shaft diameter required for given alloys and torsional loading.

C. Calculate the angle of twist.

D. Calculate the maximum power that can be safely transmitted through a given shaft.

E. Calculate safe loading through shaft couplings and keys.

UNIT 5. The objective of this unit is to enable the student to understand combined forces.

While completing this unit the student will:

A. Understand the principle of superposition.

B. Calculate the resultant stresses from combined axial and bending stresses.

C. Calculate stresses resulting from eccentrically loaded short compression members.

D. Calculate stresses from eccentrically loaded bolted joints.

E. Using "Mohr's Circle", calculate stresses.

UNIT 6. The objective of this unit is to enable the student to understand column design and stresses from loading.

While completing this unit the student will:

A. Understand the slenderness ratio and how to calculate it.

B. Understand the categories of columns (short, intermediate and long slender) and their effect on load calculations.

C. Understand how end conditions affect calculations.

D. Use column formulas to calculate safe loads.

UNIT 7. The objective of this unit is to enable the student to identify and solve indeterminate beam situations.

While completing this unit the student will:

A. Calculate stresses and displacements when the one end of the beam is fixed and the other end is supported.

B. Calculate stresses and displacements when the both ends of the beam are fixed.

UNIT 8. The objective of this unit is to enable the student to understand how to utilize computer programs to solve strength of materials problems.

While completing this unit the student will:

A. Gain practice in using computer programs to solve stress problems.

B. Gain insight into how these programs operate.

V. REFERENCE MATERIAL

Statics and Strength of Materials, 4th Edition, Bassin, Brodsky & Wolkoff. McGraw-Hill Publishers.

VI. SUPPLIES

Calculator
Loose Leaf Notebook
Paper
Pens
Pencils
Ruler

VII. GRADING STRUCTURE

90 - 100	= A
80 - 89	= B
70 - 79	= C
60 - 69	= D
0 - 59	= F

Chapter quizzes:	= 40%
Homework Assignments	= 10%
Laboratory Projects	= 20%
Final Exam	= 30%

VIII. ATTENDANCE POLICY

Students are required to attend class punctually and regularly. An absence will be assessed each time a student is not in attendance during a regularly scheduled period of instruction. Students will be assessed an absence for each three tardies.

A student is considered excessively absent when:

1. Absent from three consecutive periods of instruction.
2. Total absences equal eight.
3. In the judgement of the instructor, the student is not making satisfactory progress due to absences from class.

The first day following the period in which a student becomes excessively absent, an excessive absence report will be filed on the student in the Student Services Offices. The student will not be readmitted to class without an interview with the counselor and presentation of a signed statement agreeing to the terms for readmittance. If these terms are not met, the student may be droppped from the course. The excessive absence report becomes a part of the student's permanent file.

A period of instruction is one or more continously schduled hours of lecture or laboratory instruction for a course. Early departure from a period of instruction will be treated the same as a tardy.

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Instructional Support

COURSE SYLLABUS

TITLE INDUSTRIAL SAFETY

NUMBER ART 111

LEC 1 LAB 1 CREDIT 1

PREREQUISITE:

PREPARED BY: Gary W. Rhoades

APPROVED BY: [signature]

DATE: 01-15-91

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: [signature] DATE: 1-17-91

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INDUSTRIAL SAFETY

ART 111

COURSE DESCRIPTION:

This course is structured to create an awareness of the many safety hazards present within the industrial environment. History and growth of O.S.H.A., Human Behavior, personal Protection, Electrical, Machine and Robotic safety will be studied.

COURSE OBJECTIVES:

Upon completion of this course, each student will have a knowledge of safety practices and a working insight of safety committee procedures. With the awareness of such safety hazards as well as the corrective measures to be taken for both personal and equipment safety.

PERFORMANCE OBJECTIVES:

1. To be cognizant of the employer and employee rights
2. Understand the major provisions of Federal and State relationships as provided in industrial safety
3. Define the phsycological factors such as motivation, emotion, frustration, conflict and attitude in relation to safety.
4. To be able to select, demonstrate and use personal protection equipment
5. Practice personal protection for the prevention of common injuries during material handling.
6. Perform electrical safety in the installation, maintenance and training in the use of electrical equipment.
7. Develop safety skills in the use of machines and machine tools
8. Identify color coding, ventilating, heating and airconditioning and lighting requirements in the industrial environment.
9. To determine the safety requirements in a Robotic work-cell environment

COURSE OUTLINE:

I. Introduction:

a. Course Description
b. Course Objectives
c. Performance Objectives
d. Course Outline
e. Course Requirements

1. Keeping a notebook
2. Use of library and reference material
3. Lab exercises
4. Written reports
5. Tests
6. Grades
7. Classroom policy

II. History and Growth

a. History of the safety movement
b. Safety Today
c. Current Problems

III. Occupational Safety and Health Act

a. Administration
b. Major Provisions of OSHA Act
c. Federal and State Relations
d. Employer Rights
e. Employee Rights

IV. Human Behavior and Safety

a. Psychological Factors in Safety
b. Emotions
c. Motivation
d. Frustration and Conflict
e. Attitude and Attitude change

V. Personal Protection Equipment

a. Head Protection
b. Hearing Protection
c. Face and Eye Protection
d. Footwear
e. Special Work Clothing

VI. Material Handling

a. Preventing Common Injuries
b. Accessories for Manual Handling
c. Storage of Specific Materials
d. Problems with Hazardous Materilas

COURSE OUTLINE cont'd:

VII. Electrical Safety

a. Electrical Injuries
b. Electrical Equipment
c. Hazardous Locations
d. Installation Safety
e. Maintenance Safety
f. Employee Training

VIII. Machine and Tool Safety

a. General Safety Rules
b. Turning Machines
c. Milling Machines
d. Grinding Machines
e. Hand Tools

IX. Robotic Safety

a. Installation
b. Safety Measures
c. Emergency Stop Devices
d. Modifying the Controller
e. External Connection Units
f. Teaching and Inspection

INDUSTRIAL SAFETY

ART 111

TEXT: None

REFERENCES: Accident prevention Manual for Industrial Operations
Engineering and Technology
National Safety Council

Accident Prevention Manual for Industrial Operations
Administration and Programs
National Safety Council

Various books:

Machining Methods and Shop Theory
Electricity and Electronics
Robotics and Automation books
Other safety and O.S.H.A. regulations

Supplies: Notebook, pen and pencil
Clearview Plastic Cover
Computer or Typing paper

Materials: None

Grades: 100-90 = A 89-80 = B 79-70 = C Below 70 = F

Test.....30%
Attendance.....10%
Participation.....20%
Report.....50%

100%

Attendance: Same as Student Catalogue
Total absence must not exceed two weeks of calaases
For this course, 4 Hours.

Make-up work granted by authority and must be completed within the time frame of related absence

Classroom Policy: Students must wear proper attire for classroom and lab environment. NO HATS, SHORTS, SANDALS or OUTSIDE COATS. Shirts or tops must be worn.

NO SMOKING, DIPPING OR EATING IN THE CLASSROOM OR LAB

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COURSE SYLLABUS

TITLE ROBOT FUNDAMENTALS

NUMBER ART 211

LEC 2 LAB 3 CREDIT 3

PREREQUISITE:

PREPARED BY: Gary W. Rhoades

APPROVED BY:

DATE: 01-15-91

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: DATE:

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COURSE SYLLABUS

I. COURSE DESCRIPTION (CATALOG DESCRIPTION)

This course is an introduction to the state-of-the-art of flexible automation, and is intended for the student who will install, repair, maintain or develop robotic flexible automation systems.

II. COURSE OBJECTIVE (THE TERMINAL OBJECTIVE OF THE COURSE)

To give the student a basic familiarization of the various functions and capabilities of robots. An introduction to terms, components, programming, pendants and mechanical manipulators will prepare the student for a more indepth study in the advanced courses.

COURSE OUTLINE

I. History and Economic Impact of Robotics
- A. history of robots
- B. automation
- C. integration into the workforce
- D. increased productivity
- E. increased quality
- F. labor vs capital intensive workforce

II. Terminology
- A. definition of a robot
- B. axis
- C. degrees of freedom
- D. actuators
- E. manipulators
- F. controller
- G. power supply
- H. end-effectors

III. Classification of Robots
- A. by power source
  1. electric
  2. hydraulic
  3. pneumatic
  4. hybrid
- B. by control
  1. servo
  2. non-servo
- C. by operating methods
  1. pick and place
  2. point to point
  3. continuous path
- D. by work envelope
  1. rectangular
  2. cylindrical
  3. spherical
  4. revolute
  5. gantry

IV. Physics of Robots
- A. inertia
- B. momentum
- C. velocity
- D. degree of freedom
  1. arm
  2. wrist
  3. complex joint
- E. arm motion
  1. translation
  2. reach
  3. elevation
- F. wrist motion
  1. yaw
  2. pitch
  3. roll

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V. Robot Drive Systems
- A. electric motor
  - 1. DC
  - 2. AC
  - 3. stepper
- B. pneumatic
  - 1. linear
  - 2. rotary
- C. hydraulic
  - 1. linear
  - 2. rotary
- D. hybrid

VI. Control Mechanics
- A. limited sequence
- B. servo mechanisms
- C. sensors
- D. industrial computers
- E. feedback
  - 1. open-loop
  - 2. closed-loop
- F. axis control
  - 1. single
  - 2. multi
    - a. sequential
    - b. simultaneous

VII. Programs for Multi-axis Robots
- A. off line
- B. teach
  - 1. walk thru
  - 2. lead thru
- C. plug in

VIII. Robot Safety
- A. defining robot workspace
- B. personnel safety
- C. equipment safety
- D. safety measures
  - 1. signs
  - 2. lights
  - 3. guardrails
  - 4. enclosures
  - 5. sensors

IX. Robot Applications Overview
- A. materials handling
- B. machine loading
- C. spraying
- D. welding
- E. machining
- F. assembly
- G. insertion
- H. inspection
- I. drilling
- J. medical

Performance Objectives

Upon the completion of this unit the student will be able to:

1. Discuss the history of robots and its impact on production and the labor force.
2. Define the term ROBOT and describe the general characteristics and terminology of a robotic system.
3. Classify a robot by its power source, control, operation and working envelope. Describe the characteristics of each type of power source, control system, operating system, and working enevelope. Explain the advantages and disadvantages of each type.
4. Explain the physics of robot motion in terms of inertia, momentum and velocity. Identify the degrees of freedom and determine the limits of motion. Describe the characteristics of motion in their proper terms.
5. Describe the characteristics of different power sources and explain the advantages and disadvantages of each.
6. Describe the characteristics of different types of robot control systems, and draw a block diagram of the control elements and control signals.
7. Describe the types of user programs used to control robot systems.
8. Describe the robot work space and the different types of safety precautions in terms of personnel and equipment safety.
9. Describe different applications of robots in use today.

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COURSE SYLLABUS

IV. REFERENCE MATERIAL

ROBOTICS, AN INTRODUCTION, Douglas R. Malcom, Jr.; Breton Publishers

INTRODUCTION TO ROBOTICS, James Rehg; Prentiss-Hall

ROBOTICS, David M. Osborne; Midwest Sci-Tech

INDUSTRIAL ROBOTS & ROBOTICS, Edward Kafrissen, Mark Stephans; Reston

INDUSTRIAL ROBOTS, J. J. Warnecke, R. D. Schraft; IFS Publications Ltd.

ROBOTICS & AUTOMATED MANUFACTURING, Richard C. Dorf; Reston

V. SUPPLIES

none required

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COURSE SYLLABUS

VI. GRADING PROCEDURE

Final grade to consist of 70% lecture, 30% lab scores.

1. Lecture (modified percentage-total points)
   a. scheduled tests (30)
   b. comprehensive final exam (30)
   c. notebook/information (30)

2. Lab
   a. participation (10)
   b. performance (10)
   c. lab manual (10)

VII. ATTENDANCE POLICY

A student is considered excessively absent from course when:

1. absent from three consecutive periods of instruction after the date date enrolled, or

2. total absences equal the number of periods of instruction scheduled in two calendar weeks, or

3. in the judgment of the instructor, the student is not making satisfactory progress due to absence from class and it is not feasible for the student to make up the missed work.

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Texas State Technical Institute
Instructional Support

COURSE SYLLABUS

TITLE PNEUMATICS

NUMBER ART 225

LEC 3 LAB 3 CREDIT 4

PREREQUISITE:

PREPARED BY: Gary W. Rhoades

APPROVED BY: Gary W. Rhoades

DATE: 01-15-91

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: _____ DATE: 1-17-91

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COURSE SYLLABUS

I. COURSE DESCRIPTION (CATALOG DESCRIPTION)

This course is designed to give a complete overview of pneumatic formulas, principles, functions and circuits. Hands-on experience will relate to industrial automated systems.

II. COURSE OBJECTIVE (THE TERMINAL OBJECTIVE OF THE COURSE)

Upon completion of this course, the student will have working knowledge of directional control valves, different cylinders, symbols, formulas, characteristics of pneumatics, effects of temperature and environment, compressors, intensifiers, gauges, flow controls, after coolers, driers and other associated equipment to make up an automated industrial environment.

COURSE OUTLINE

I. Introduction
- A. purpose of course
- B. course requirements
  - 1. keeping a notebook
  - 2. library
  - 3. tests
- C. classroom policy

II. Evolution of Compressed Air

III. Force Transmission
- A. thru a solid
- B. thru a fluid
- C. pascal's law
- D. pressure
- E. cylinders
- F. intensifiers
- G. pressure scales
  - 1. absolute
  - 2. gage
- H. atmospheric pressure
- I. vacuum pressure
- J. pressure gages
  - 1. bourdon tube
  - 2. plunger
  - 3. vacuum

IV. Energy Transmission
- A. gas characteristics
- B. gas temperature
- C. air compression
- D. air expansion
- E. positive displacement compressor
- F. flow rate
- G. system design

V. Control of Pneumatic Energy
- A. symbols
- B. valves
- C. pressure switches
- D. relief valve
- E. pressure regulatorss
- F. actuator direction
- G. double-acting cylinders
- H. directional control valves
- I. flow rate
- J. needle valves

VI. Compressors and Distribution Systems
- A. compressor types
  - 1. displacement
  - 2. dynamic
- B. reciever tanks
- C. driers
- D. aftercoolers
- E. absorption
- F. unit system
- G. loop system

VII. Check Valves, Cylinders, and Motors
- A. check valves
- B. seals
- C. cylinder mounting
- D. cylinder loads
- E. cushions
- F. flow rates for cylinders
- G. motors
  - 1. rotary
  - 2. piston
  - 3. vane
  - 4. turbine

VIII. Directional Control Valves
- A. types of valves
  - 1. two-way
  - 2. three-way
  - 3. four-way
- B. position
  - 1. two-position
  - 2. three-position
- C. valve actuators
  - 1. manual
  - 2. solenoid
  - 3. pilot
  - 4. spring
  - 5. detent
- D. shear action valves
  - 1. sliding plate
  - 2. lapped spool
  - 3. packed spool
  - 4. packed bore
- E. poppet-type valves
- F. flow coefficient

IX. Flow Control, Silencers, and Quick Exhaust
- A. orifice control
  - 1. fixed
  - 2. adjustable
    - a. ball
    - b. globe
    - c. needle
- B. speed control
- C. quick exhaust valves
- D. silencers

X. Sequence, Regulators, Excess Flow, and Boosters
- A. sequence valves
- B. types of regulators
  - 1. non venting
  - 2. venting
  - 3. pilot controlled
- C. differential pressure circuit
- D. dual pressure circuit
- E. boosters
- F. excess flow valves

XI. Air Preparation
- A. contaminants
- B. filters
- C. lubricators

Performance Objectives

Upon completion of this unit the student will be able to

1. give a brief history of the evolution of compressed air.
2. express the manner in which a force is transmitted thru a confined fluid and determine the intensity of that force regardless of the pressure scale used.
3. explain the basic operation of transmitting energy thru a pneumatic fluidpower system with respect to various gas laws.
4. identify components by their schematic symbols, and explain the basic operation of typical pneumatic circuits.
5. identify, maintain, and operate compressors from typical pneumatic systems and be able to describe their operation and principles that effect their operation.
6. explain the basic operation and application of check valves, motors, and cylinders.
7. identify schematic symbols and explain the operation of circuits containing directional control valves. Identify, operate, and maintain directional control valves.
8. identify schematic symbols and explain the operation of circuits containing flow control valves, silencers, and quick exhaust valves. Explain the operation and placement of these components.
9. identify regulators, boosters, excess flow and sequence valves that are found in typical pneumatic systems, and explain their relationship to the operating system.
10. explain the causes of contaimination in a pneumatic system and the measures necessary to correct them.

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COURSE SYLLABUS

IV. REFERENCE MATERIAL

1. Industrial Pneumatic Technology
   Parker Fluidpower

2. Pneumatic Basics Industrial Technology Manual
   Amatrol

V. SUPPLIES

none required

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COURSE SYLLABUS

VI. GRADING PROCEDURE

Final grade to consist of 70% lecture, 30% lab scores.

1. Lecture (modified percentage = total points)
   a. scheduled tests (30)
   b. comprehensive final exam (30)
   c. notebook/information (30)

2. Lab
   a. participation (10)
   b. performance (10)
   c. lab manual (10)

VII. ATTENDANCE POLICY

A student is considered excessively absent from the course when:

1. absent from three consecutive periods of instruction after the date enrolled, or

2. total absences equal the number of periods of instruction scheduled in to calendar weeks, or

3. in the judgment of the instructor, the student is not making satisfactory progress due to absence from class and it is not feasible for the student to make up the missed work.

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Texas State Technical Institute
Instructional Support

COURSE SYLLABUS

TITLE HYDRAULICS

NUMBER ART 231

LEC 3 LAB 9 CREDIT 6

PREREQUISITE:

PREPARED BY: Gary W. Rhoades

APPROVED BY: Gary W. Rhoades

DATE: 01-28-91

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: [signature] DATE: 1-28-91

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COURSE SYLLABUS

I. COURSE DESCRIPTION (CATALOG DESCRIPTION)

A study of the fundamentals of fluid power. The application, function, construction and operation will include pumps, motors, cylinders, valves, and components. Installation and maintenance will be stressed.

II. COURSE OBJECTIVE (THE TERMINAL OBJECTIVE OF THE COURSE)

Upon completion of the course, the student will have a working knowledge of the hydraulic (fluid power) area to include different valves, pumps, actuators, accumulators, symbols, maintenance checklists and associated equipment.

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COURSE SYLLABUS

III. COURSE OUTLINE

A: CONTENT

I. INTRODUCTION
- A. Purpose of course
- B. Course requirements
  1. keeping a notebook
  2. library
  3. tests
- C. Classroom policy

II. BASIC OPERATION
- A. Energy (kinetic and potential)
- B. Force
- C. Power
- D. Inertia
- E. Pressure

III. PUMP INSTALLATION AND OPERATION
- A. Location
- B. Head pressure
- C. Cavitation
- D. Gauges
- E. Specifications
- F. Different types (vane and gear)

IV. HYDRAULIC ACTUATORS
- A. Cylinders
- B. Motors (different types)
- C. Different types

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COURSE SYLLABUS

III. COURSE OUTLINE

A: CONTENT - continued

V. CONTROL OF HYDRAULIC ENERGY
- A. Symbols
- B. Valves (two-way, three-way, and four-way)
- C. Pressure reliefs
- D. Check valves
- E. Flow control
- F. Accumulators
- G. Reservoirs (tank)
- H. Polishing
- I. Piloting

VI. PREVENTIVE MAINTENANCE
- A. Polishing techniques
- B. Fluid sampling (Gulf test)
- C. Checklists
- D. Filters

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COURSE SYLLABUS

III. COURSE OUTLINE

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

1. identify different applications in industry.
2. use gauges to acknowledge results from different pressures.
3. break down hydraulic cylinder and re-assemble. Check out functions after re-assembly.
4. break down pump and identify parts.
5. identify different symbols of a hydraulic system schematic.
6. identify different valves in hydraulic system (lab).
7. perform actual checklist (preventive maintenance) on hydraulic trainer.
8. understand how polishing affects a hydraulic system.

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COURSE SYLLABUS

IV. REFERENCE MATERIAL

A. Industrial Hydraulic Technology
Parker Fluid Power

B. Industrial Technology Trainer, Vol. 1
Don Perkins
Amatrol

C. Industrial Technology Trainer, Vol. 2
Don Perkins
Amatrol

V. SUPPLIES

none required

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Texas State Technical Institute

COURSE SYLLABUS

VI. GRADING PROCEDURE

Final grade to consist of 70% lecture and 30% lab

A. Tests = 70%

B. Lab and report = 30%

VII. ATTENDANCE POLICY

A student is considered excessively absent from the course when:

1. absent from three consecutive periods of instruction after the date enrolled, or

2. total absences equal the number of periods of instruction scheduled in two calendar weeks, or

3. in the judgment of the instructor, the student is not making satisfactory progress due to absence from class and it is not feasible for the student to make up the missed work.

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Texas State Technical Institute
Instructional Support

COURSE SYLLABUS

TITLE QUALITY ASSURANCE

NUMBER ART 232

LEC 2 LAB 3 CREDIT 3

PREREQUISITE:

PREPARED BY: SANG-SHIUN CHAN

APPROVED BY: GARY RHOADES

DATE:

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: Bill Barnes DATE: 12/12/90

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COURSE SYLLABUS

I. COURSE DESCRIPTION (CATALOG DESCRIPTION)

This course is the study of measurements, inspection, statistical process control and their application to automated manufacturing systems.

II. COURSE OBJECTIVE (THE TERMINAL OBJECTIVE OF THE COURSE)

To enhance the student's knowledge and skills in Quality Assurance technology through the practice of preventing unsatisfactory goods.

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COURSE SYLLABUS

III. COURSE OUTLINE

A: CONTENT

I. Basic Structure:

a. Statistics
b. Average measurement data
c. Statistical Quality Assurance
d. Interpretation of the data

II. Normal Distribution:

a. The Normal Distribution
b. Interpretation of Normal Distribution
c. Calculation of Area between Limits Given in U
d. The Normal Distribution to determine Process Capability.
e. Calculations of Area Between Limits Given in Measurement Values
f. Percentage of Production Out of Specification Limits.

III. Sample Data:

a. Quality Assurance Notation
b. Population Data
c. Sample Data
d. Data from groups of samples
e. Estimation
   1. Population from sample data
   2. Population Characteristics from sample data
   3. Population Characteristics from using sample information
   4. Process Limits from sample data

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COURSE SYLLABUS

IV. Control Charts:

a. Sample Mean Distribution
b. Development and use of Control Charts
c. Control Charts in decision making
d. Control Charts in the Complex Process

V. Probability:

a. Probability Theory
b. Simple Probability
c. Compound Probability
   1. Two or more events
   2. One of several events
d. Probability of Combined Events
e. Combinations

VI. Control Chart Sample Size:

a. Process mean Shift
b. Improving the Probability of Detecting
   1. Mean Shift
   2. Sample size
   3. Sample frequency
   4. Changing Control Chart limits
c. Control Charts with given confidence levels

VII. Probability Distribution:

a. The Binomial Distribution
b. The Poisson Distribution

VIII. Control Charts for Attributes:

a. Fraction Defective Chart
b. Number Defective Chart
c. Control Chart for Number of Defects
d. Average Number of Defects Chart
e. Similarity of np and c Charts
f. Detecting shifts in Average Quality
   1. The c and np Charts
   2. Detecting Population shift
g. Using the c and np Cahrts

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COURSE SYLLABUS

IX. Sampling PLans:

a. Acceptance Sampling
b. The Sample
c. Standard Sampling Plans
d. Selecting a Standard Sampling plan
e. Sampling for Variables
f. A Complete Acceptance Sampling Procedure
g. Normal Reduced and Tightening Inspection
h. Alternatives to Acceptance Inspection

X. Integrating Quality Assurance:

a. Collecting the Data
b. Communicating the data
c. The Root Cause
d. Available Documentation

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COURSE SYLLABUS

III. COURSE OUTLINE

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

Each student shall, upon successful completion of this course:

Unit 1:
- Organize measurement data into a frequency chart.
- Calculate a data mean and standard deviation.
- Determine process capabilities.
- Compare process capability with specifications.

Unit 2:
- Describe the normal distribution.
- Calculate the area under the normal curve between limits.
- Using the valus of $\bar{X}$ and σ, determine a process capability.
- Using a process $\bar{X}$ and σ, determine the percentage of production between any two limits.
- Using a process $\bar{X}$ and σ, determine the percentage of production below or above specification limits.
- Calculate a process $\bar{X}$ that would maximize the percentage of production within a given specification.

Unit 3:
- Calculate a sample mean, range, and standard deviation.
- From a group of samples, calculate the average sample mean, average sample range, average sample standard deviation, and the standard deviation of sample means.
- Estimate the process standard deviation from the sample data.
- Estimate the 3σ process limits from sample data.

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Texas State Technical Institute

COURSE SYLLABUS

III. COURSE OUTLINE

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

Each student shall, upon successful completion to this course:

Unit 4: .Use control charts.
.Develop control charts for sample averages.
.Develop control charts for sample ranges.
.Develop control charts for sample standard deviations.
.Interpret control charts.
.Use control charts in decision making.
.Use control charts in complex processes.

Unit 5: .Calculate the probability of simple events.
.Calculate the probability of compound events.
.Calculate the number of combinations of posssible events.
.Calculate the probability that a sample will contain a certain number of bad items.

Unit 6: .Calculate the probability that a single sample will detect a given shift of the process mean.
.Calculate the sample size and number of samples that may be taken before a given shift of the process mean will be detected at a given level of confidence.
.Develop a control chart to provide a given level of confidence that a specified process mean shift will be detected.

Unit 7: .Use the binomial distribution to calculate the probability of a certain number of defects in a sample.
.Use the Poisson distribution to calculate the probability of a certain number of defects in a sample.

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Texas State Technical Institute

COURSE SYLLABUS

III. COURSE OUTLINE

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

Each student shall, upon successful completion of this course:

Unit 8:
- Calculate the limits for charts.
- Calculate the limits for np charts.
- Calculate the limits for c charts.
- Calculate the limits for u charts.
- Calculate the sample size and/or sample frequency required to detect a population change with a given confidence level.

Unit 9:
- Develop a sampling plan.
- Calculate the probability of accepting a satisfactory lot.
- Calculate the probability of accepting an inferior lot.
- Calculate the probability of rejecting a satisfactory lot.
- Use a standard sampling plan for attributes.
- Use a standard sampling plan for variables.

Unit 10:
- Collect necessary rejection data.
- Display rejection data.
- Use an assembly chart to find the cause of rejection.
- Use a process chart to find the cause of rejection.

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COURSE SYLLABUS

IV. REFERENCE MATERIAL

Textbook: Statistical Quality Assurance
Francis J. Guldner
Delmar Publishers Inc.

References: Statistical Process Control
General Electric Company
Greater Cincinna Indutrial Train Corp.

Statistical Quality Control
Dr. David Osborn
Abilene Christian University

V. SUPPLIES

Notebook, pen and pencil
Clearview plastic cover
2 blank 51/4 computer disks

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Texas State Technical Institute

COURSE SYLLABUS

VI. GRADING PROCEDURE

Grades: 100-90 = A 89-80 = B 79-70 = C Below 70 = F

Tests	30%
Final	30%
Labs	30%
Repart	10%
	100%

VII. ATTENDANCE POLICY

Attendance: Same as student catalogue
Total absence must not exceed two weeks of classes

Make-up work granted by authority and must be completed within the time frame of related absence

Classroom Policy: Students must wear proper attire for classroom and lab environment. NO HATS, SHORTS, SANDALS OR OUTSIDE COATS. Shirts or tops must be worn.

NO SMOKING, DIPPING, OR EATING IN CLASS OR LAB

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Texas State Technical Institute
Instructional Support

COURSE SYLLABUS

TITLE PROGRAMMABLE CONTROLLERS

NUMBER ART 233

LEC 2 LAB 4 CREDIT 3

PREREQUISITE:

PREPARED BY: SANG-SHIUN CHAN

APPROVED BY: GARY RHOADES

DATE:

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: Bill Barnes DATE: 12/17/90

RECEIVED
DEC 17 1990
INST. DIVISION
TSTI-SWEETWATER

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Texas State Technical Institute

COURSE SYLLABUS

I. COURSE DESCRIPTION (CATALOG DESCRIPTION)

This course is a study in programmable controllers that include processor units, numbering systems, memory organization, relay type devices, timers, counters and data manipulators.

II. COURSE OBJECTIVE (THE TERMINAL OBJECTIVE OF THE COURSE)

The course enables the students to have proficient skills in working with the PC's. It also gives the students a good foudation upon which additional PC skills and understading can be built.

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COURSE SYLLABUS

III. COURSE OUTLINE

A: CONTENT

I. What is a Programmable Controller (PC)?

II. Understanding the Input/Output(I/O) Section

a. I/O Rack
b. AC/DC Digital Input Modules
c. AC Output Modules
d. Safety Circuit
e. DC output Modules
f. Transistor-Transistor Logic (TTL) Input and Output Modules
g. Analog Input and Output Module
h. Thermocouple Input Module
i. Reed Relay Output Module
j. Electrical Noise
k. I/O Shielding

III. Processor Unit

a. The Processor
b. Memory Designs
c. Memory Size
d. Categories of Memory
e. Peripherals

IV. Numbering Systems

a. Decimal System
b. Binary System
c. Binary Coded Decimal (BCD) System
d. Hexadecimal System
e. Octal System
f. Binary Coded Decimal (BCO) System

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COURSE SYLLABUS

V. Memory Organization

a. Storage Memory
b. User Memory

VI. Understanding and Using Ladder Diagrams

a. Wiring Diagrams
b. Ladder Diagrams
c. Basic Stop/Start Circuit
d. Sequenced Motor Starting

VII. Relay type Instructions

a. Programming Contacts
b. Limitations of Ladder Diagram
c. Programming Restrictions

VIII. Programming Devices (Programmers)

a. Desktop Programmers
b. CRT
c. Keyboard
d. Peripherals
f. Hand-held Programmers

IX. Small Programmable Controllers

a. Small PC's
b. Boolean Algebra
c. Programming in Boolean
d. Timers

X. Latching and Master Control Relays

a. Latching Relays
b. Master Control Relay
c. Safety Circuit

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COURSE SYLLABUS

XI. Programming Timers

a. Pneumatic Timers (General)
b. Allen-Bradley Timers
c. Westinghouse Timers
d. Square D Company Timers
e. Gould Inc., Modicon Division Timers
f. Cascading Timers

XII. Programming Counters

a. Allen-Bradley Counters
b. Westinghouse Counters
c. Square D Company counters

XIII. Data Manipulation

a. Data Transfer
b. Data Compare

XIV. Arithmetic Function

a. 2's Complement
b. Addition, Subtraction, Multiplication, Division

XV. Word and File Moves

a. Words
b. Synchronous Shift Registers
c. File Moves
d. Word to ile Instruction
e. File to Word Instruction
f. File to File Instruction
g. Asynchronous Shift Register (FIFO)

XVI. Sequencers

a. Masks
b. Timer-driven Sequencers
c. Event-driven Sequencers

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Texas State Technical Institute

COURSE SYLLABUS

III. COURSE OUTLINE

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

Each student shall, upon successful completion of this course:

Unit 1:
- .Describe serval advantages of a programmable controller over hand wired relay systems.
- .Identify the main components of a typical programmable controller and describe the function of each.

Unit 2:
- .Describe the I/O section of a programmable controller.
- .Explain why a hard wired emergency stop function is desirable.
- .Describe how basic AC/DC input and output modules work.
- .Work on input/output shielding does.

Unit 3:
- .Convert memory size into actual memory words.
- .Describe the function of the processor.
- .Identify and explain the different peropheral devices that can be used with a programmable controller.

Unit 4:
- .Convert from one numbering system to another.

Unit 5:
- .Identify the types of information stored in each category of memory.

Unit 6:
- .Convert a wiring diagram to a ladder diagram.
- .List the rules that govern a ladder diagram.

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Texas State Technical Institute

COURSE SYLLABUS

III. COURSE OUTLINE

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

Unit 7: .Convert a ladder diagrm with vertical contacts to PC format.
.Write a program that eliminates nested contacts.

Unit 8: .Do the "on line programming".
.Do basic programming techniques.
.Describe the FORCE ON and FORCE OFF feature and the hazards that could be associated with its use.

Unit 9: .Interpret truth tables.
.Use Boolean functions to write simple programs.

Unit 10: .Write a program using a latching relay.
.Write a program using a master control relay.
.Understand the importance of a safety circuit.

Unit 11: .Write a program using ON delay and OFF delay timers.
.Describe the difference between an ON delay timer and a retentive timer.
.How to extend the time range of timers by cascading timers.

Unit 12: .Write a program using up and down counters.

Unit 13: .Write a rung of logic that transfers data from one word to another.
.Write logic that compares data to control an output.

Unit 14: .Writing a program using the four standard math functions available with most PCs.

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Texas State Technical Institute

COURSE SYLLABUS

III. COURSE OUTLINE

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

Unit 15: .Write a program using the function of word to file, file to word, and file to file instructions.

Unit 16: .Write a program using the basics of sequencer function.

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COURSE SYLLABUS

IV. REFERENCE MATERIAL

Textbook: Technician's Guide Programmable Controllers
Richard A. Cox
Delmar Publishers Inc.

References: Programmable Controllers
L. A. Bryan and E. A. Bryan
Industrial Text Company

V. SUPPLIES

Materials: None

Supplies : Notebook, pen and pencil
Sketch pad, scale and triangle
Clear-view plastic cover
2 blank 5 1/4 computer disks

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Texas State Technical Institute

COURSE SYLLABUS

VI. GRADING PROCEDURE

Grades: 100-90 = A 89-80 = B 79-70 = C Below 70 = F

Tests.....30%
Final.....30%
Labs.....30%
Repart.....10%

100%

VII. ATTENDANCE POLICY

Attendance: Same as student catalogue
Total abscence must not exceed two weeks of classes

Make-up work granted by authority and must be completed within the time frame of related abscence

Classroom Policy: Students must wear proper attire for classroom and lab environment. NO HATS, SHORTS, SANDALS OR OUTSIDE COATS. Shirts or tops must be worn.

NO SMOKING, DIPPING, OR EATING IN CLASS OR LAB

Texas State Technical College Sweetwater

INSTRUCTIONAL SUPPORT

COURSE SYLLABUS

TITLE METROLOGY/MEASUREMENT

NUMBER MTC 1313

LEC 2 LAB 3 CREDIT 3

PREREQUISITE: NONE

PREPARED BY: T. J. Beck

APPROVED BY: Bill Bowers

DATE: 9-15-92

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY:	DATE:

I. COURSE DESCRIPTION (Catalog Description)

This course is a comprehensive study of the terminology, methodology and practice of measurement systems, equipment and equipment.

II. COURSE OBJECTIVE (The Terminal Objective of the Course)

To enable the student to understand the theory and practice of inspection in industry and how specifications aid the inspector. Included are American and Metric Coodinate System and Geometric Dimensioning and Tolerancing (GDT).

III. COURSE OUTLINE

A. CONTENT - UNITS

1.0 Need and Function of Inspection in Industry; How Specifications Aid the Inspector

- 1.1 Types of Facilities
- 1.2. Role of Drawings, Specifications and Operation Sheets
- 1.3 Functions of Inspector
- 1.4 Classifications of Inspections

2.0 Tolerances and Allowances

- 2.1 Purpose of and Need For Tolerances
- 2.2 Theoretical and Actual Part Size
- 2.3 Geometrical Tolerancing (GDT) Method
- 2.4 Coordinate System
- 2.5 GDT Symbols: Maximum Material Condition (MMC) and Least Material Condition (LMC)

3.0 Datums and Feature Control Frames

- 3.1 Principles of Datums; Primary, Secondary, Tertiary Datums
- 3.2 Datum Targets used in Inspection
- 3.3 Inspection Techniques & Datums of Size
- 3.4 Using Feature Control Frames

4.0 Five General rules of GDT

- 4.1 Tolerances of Size/Form
- 4.2 Datums of Size
- 4.3 Form/Orientation
- 4.4 Screw Threads, Splines and Gears
- 4.5 Virtual Condition

5.0 Importance of Plus and Minus Tolerances

- 5.1 Using GDT in Design to Define Mating Parts
- 5.2 Straightness
- 5.3 Flatness
- 5.4 Perpendicularity
- 5.5 Angularity
- 5.6 Parallelism
- 5.7 Design Requirements Dictate Control

6.0 Virtual Condition (VC)

- 6.1 Defining and Identifying Virtual Condition
- 6.2 Types of Workholding Device
- 6.3 Selection of Clamping Device

7.0 Tolerance and Location

- 7.1 Relationship of GDT to Production Yields
- 7.2 Measuring Concentricity

8.0 Standards

- 8.1 International (ISO), National (MIL-STD) and Industry Standards
- 8.2 Measuring Surface Finishes
- 8.3 Acceptance/Rejection Standard
- 8.4 Material Review Board
- 8.5 Inspection Set-up, Inspection, and Put -Away Procedures
- 8.6 Inspection Errors: Recognition and Prevention
- 8.7 Acceptable Quality Level (AQL)
- 8.8 Inspection Records
- 8.9 X-Bar and R-Control Charts

9.0 Basic Principles and Techniques of Measurement

- 9.1 Using Measurement Tools
- 9.2 Using Inches and Millimeters
- 9.3 Calibration
- 9.4 Direct and Indirect Measurements

10.0 Surface Plate Methods and Equipment, and Mechanical Indicating Equipment.

- 10.1 Classifications of Gage Blocks
- 10.2 Using Gage Blocks
- 10.3 Effect of Temperature on Gage Blocks
- 10.4 Surface Plate Care and Use
- 10.5 Height Gage, V-Blocks, Planer Gage and Dial Test Indicator

11.0 Electrical and air Gaging Equipment

- 11.1 Advantages of Electric/Electronic Comparators
- 11.2 Precautions in Using Electronic Equipment
- 11.3 Air Gage and Air Gage Head

12.0 Optical Measuring and Inspection Equipment

- 12.1 Toolmakers Microscope
- 12.2 Optical Flat
- 12.3 Optical Comparator or Projector

13.0 Gaging and Inspection of Screw Threads

- 13.1 Thread Measurement
- 13.2 Using a Screw Pitch Gage
- 13.3 Thread Ring Gages
- 13.4 Three-Wire Method of Thread Measurement

14.0 Special Measuring and Inspection Problems

- 14.1 Measuring Angles
- 14.2 Sine Plates and Bars
- 14.3 Roll Method in Measuring Taper-Angle
- 14.4 Diameters and Thickness

15.0 Gage Checking and Calibration

- 15.1 Importance of Calibration Program
- 15.2 Degree of Accuracy Required in Calibration Equipment
- 15.3 Effect of Temperature on Calibration Equipment
- 15.4 Running a Gage Control Program

16.0 Measuring in Millionths

- 16.1 Human Requirements in Micro-Measurements
- 16.2 Ensuring Accuracy in Micro-Measuring Equipment
- 16.3 Identifying and Preventing Environmental Influences: Air Drafts and Vibrations

17.0 Coordinate Measuring Machines (CMM)

- 17.1 Theory and Advantages of CMM
- 17.2 Using a CMM
- 17.3 Recognition and Prevention of Errors When Using a CMM

18.0 Nondestructive Testing

- 18.1 Advantages & Disadvantages of Nondestructive Testing
- 18.2 Radiation Safety Hazards
- 18.3 Ultrasonic Inspection
- 18.4 Magnetic Particle Inspection

B. PERFORMANCE OBJECTIVES FOR EACH UNIT

UNIT 1. The objective of this unit is to enable the student to understand the need and function of inspection in industry and how specifications aid the inspector.

While completing this unit the student will:

A. List some of the differences between small and large facilities.

B. Understand the role of drawings, specifications, and Operation Sheets.

C. Understand the need for "independent eyes" in inspection.

D. Explain why "final inspection only" is rarely adequate, and what the other classifications of inspection are.

E. Understand the sequence of inspection.

UNIT 2. The objective of this unit is to enable the student to understand the theory and practice of tolerances and allowances, and to determine how a part should be inspected by interpretation of the drawing.

While completing this unit the student will:

A. Explain the need for tolerances, and the difference between theoretical and actual part size.

B. Understand and use unilateral and bilateral tolerances.

C. Show how Geometrical Dimensioning and Tolerancing (GDT) is more specific than the coordinate system.

D. Understand and use the GDT symbols for Maximum Material Condition (MMC) and Least Material Condition (LMC) regardless of feature size (RFS).

UNIT 3. The objective of this unit is to enable the student to understand and use Datums and Feature Control Frames.

While completing this chapter the student will:

A. Understand the principles of Datums and define primary, secondary and tertiary datums of a part.

B. Understand and demonstrate how to inspect a part, given datum targets (point, line and area).

C. Understand and demonstrate how to inspect a part, given datums of size (externally and internally cylindrical).

D. Understand and demonstrate how to use feature control frames, including Geometric Characteristic symbol, tolerance, data reference letters, and modifiers.

UNIT 4. The objective of this unit is to enable the student to understand the five (5) general rules of GDT and apply them to a piece part design.

While completing this chapter the student will:

A. Understand and apply the GDT rule that when only a tolerance of size is specified, then that tolerance controls both size and form.

B. Show that when position or datums of size are specified, modifiers must also be specified.

C. Apply the GDT rule that when form/orientation is specified, the modifer "regardless of feature size" is implied.

D. Show that for screw threads, splines and gears the tolerance and datum reference originate from the pitch cylinder axis.

E. Understand and demonstrate that a virtual condition exists for features of size and datum features of size.

UNIT 5. The objective of this unit is to give the student experience in working with the concept that the plus or minus size tolerance must be considered first, and then the geometric location.

While completing this chapter the student will:

A. Understand and use GDT in design to provide a means to define mating parts completely.

B. Demonstrate that straightness controls only one line element at a time or the straightness of an axis.

C. Show that flatness controls all elements or points of a surface.

D. Show how perpendicularity may be specified for a plane or line element.

E. Understand that angularity may also be related to a surface or line depending upon application.

F. Show how parallelism can be related to a surface or a line.

G. Undersand and apply the concept that design requirements dictate the control to be specified, and that parts are not designed for themselves but are designed for function and relationship in a final assembly.

UNIT 6. The objective of this unit is to enable the student to understand and apply Virtual Condition (VC) and to recognize that inspection gages must be designed to inspect for VC of a part.

While completing this chapter the student will:

A. Understand the VC principle that the Virtual Condition of a part is the boundary established by the collective effect of size and geometric tolerance.

B. Understand that VC is the Maximum Material Condition (MMC) plus the specified geometric tolerance.

B. Identify the types of workholding devices.

C. Match the characteristics and applications to a particular type of clamping device.

UNIT 7. The objective of this unit is to help the student apply the concept of Tolerance and Location.

While completing this unit the student will:

A. Understand and apply the principle that GDT encourages tolerance maximums and increases production yields.

B. Explain why concentricity is difficult to verify and should be limited to features requiring dynamic balance.

UNIT 8. The objective of this unit is to understand and use Standards and Basic Procedures. This unit includes International (ISO 9000), National (MIL-STD), and Industry standards.

While completing this unit the student will:

A. Understand and be able to measure surface finishes.

B. Understand and be able to set up a rejection/ acceptance standard for visual inspection.

C. Explain when, why, and who can overrule an inspector's decisions (Material Review Board).

D. Understand and demonstrate the procedure for "Inspection Setup", "Inspection" and "Put Away".

E. Recognize common types of inspection errors and demonstrate how to avoid them, including: parallax, rounding off, and flinching.

F. Understand the principle of Acceptable Quality Level (AQL) and its sampling requirements.

G. Demonstrate how to conduct Final Inspection, Process Audit, and First-Piece Inspection.

H. Understand how and why inspection records are so important.

I. Understand and use a X-Bar and R-Control Chart.

UNIT 9. The objective of this unit is to enable the student to use measurement tools, including steel rules, square, protractor, indirect calipers, dial calipers, Vernier calipers, height gage, depth gage, micrometer, telescope-type gage, snap gage, ring gage, go-no-go gage, plug gage, feeler gage, radius gage, flush-pin gage and adjustable parallels.

While completing this unit the student will:

A. Measure items in both inches and millimeters.

B. Check the zero reading and calibrate micrometers.

C. Take both direct and indirect measurements using inside micrometers and calipers/ micrometers.
design.

UNIT 10. The objective of this unit is to give the student practice in applying the principles of surface plates and related equipment.

While completing this unit the student will:

A. Understand and practice handling and use of gage blocks.

B. Know the difference between "Master" gage blocks, "Inspection" blocks and "Working" blocks, and how to use each type.

C. Correctly select gage blocks to generate the desired dimensions.

D. Explain the effects of temperature on gage blocks, and calculate the growth due to a given temperature rise and fall.

E. Demonstrate surface plate care and use.

F. Demonstrate correct use of the height gage, V-blocks, planer gage and dial test indicator.

UNIT 11. The objective of this unit is to enable the student to understand the theory and practice of electrical and air gaging equipment.

While completing this unit the student will:

A. Tell the advantages of electric and electronic comparators and explain how they work.

B. Understand and practice the required precautions when using electronic equipment.

C. Sketch a schematic of an air gage and air gage head.

D. Explain why an air gage is more accurate than a plug or telescoping gage.

UNIT 12. The objective of this unit is to enable the student to understand the theory and use of optical measuring and inspection equipment.

While completing this unit the student will:

A. Know when a toolmaker's microscope is most useful.

B. Know how an optical flat works and how to use one.

C. Know how an optical comparator or projector works and how to use it to measure parts by micrometer table feed or template.

UNIT 13. The objective of this unit is to enable the student to understand the theory of, and demonstrate the gaging and inspection of screw threads.

While completing this unit the student will:

A. Set up the correct sequence of thread measurement and determine size and quality.

B. Correctly use a screw pitch gage.

C. Understand how thread ring gages are used.

D. Understand the three-wire method of thread measurement.

UNIT 14. To enable the student to apply inspection techniques and principles to special inspection problems.

IV. REFERENCE MATERIAL

A. Inspection and Gaging, 6th Edition, Kennedy, Hoffman, Bond. Industrial Press, Inc. ISBN 0-8311-1149-6.

B. Interpretation of Geometric Dimensioning and Tolerancing, Daniel E. Puncochar. Industrial Press, Inc. ISBN 0-8311-3010-5

v. SUPPLIES

Tool Kit (containing 6-inch dial calipers, 1-inch micrometer, and steel rule)
Loose Leaf Notebook
Paper
Pens
Pencils

VI. GRADING STRUCTURE

90 - 100 = A
80 - 89 = B
70 - 79 = C
60 - 69 = D
0 - 59 = F

Chapter quizzes:	= 40%
Homework Assignments	= 10%
Laboratory Projects	= 20%
Final Exam	= 30%

VII. ATTENDANCE POLICY

Students are required to attend class punctually and regularly. An absence will be assessed each time a student is not in attendance during a regularly scheduled period of instruction. Students will be assessed an absence for each three tardies.

A student is considered excessively absent when:

1. Absent from three consecutive periods of instruction.
2. Total absences equal eight.
3. In the judgement of the instructor, the student is not making satisfactory progress due to absences from class.

The first day following the period in which a student becomes excessively absent, an excessive absence report will be filed on the student in the Student Services Offices. The student will not be readmitted to class without an interview with the counselor and presentation of a signed statement agreeing to the terms for readmittance. If these terms are not met, the student may be droppped from the course. The excessive absence report becomes a part of the student's permanent file.

A period of instruction is one or more continously schduled hours of lecture or laboratory instruction for a course. Early departure from a period of instruction will be treated the same as a tardy.

TSTI SWEETWATER

Texas State Technical Institute
Instructional Support

COURSE SYLLABUS

TITLE NC/CNC PROGRAMMING

NUMBER ART 234

LEC 2 LAB 3 CREDIT 3

PREREQUISITE:

PREPARED BY: Gary Rhoades

APPROVED BY: Gil Barnes

DATE: 11-27-90

This syllabus has been reviewed and is current on the date indicated.

REVIEWED BY: _____ DATE: _____

_____ _____

_____ _____

_____ _____

RECEIVED
NOV 27 1990
INST. DIVISION
TSTI-SWEETWATER

NC/CNC PROGRAMMING

ART 234

COURSE DESCRIPTION:

A study of the principles and concepts of numerical control through computer application, specifically in the area of APT programming for the control of machine tools in Computer Aided Manufacturing.

COURSE OBJECTIVE:

To give the student a more thorough understanding of NC/CNC programming and develop the skills that are necessary to attain a more coceptual knowledge of numerical control.

PERFORMANCE OBJECTIVES:

1. Identify basic types of numerical controlled machines
2. Understand the fundamental steps of planning for the use of numerical control.
3. Describe axes relationships and tape readout characteristics.
4. Understand and use the cartesian coordinate system with N/C and machine axes control systems.
5. Understand basic part programming methology.
6. Understand linear and circular interpolation.
7. Perform a written process and program simulation.
8. Write an exercise in specific programming.
9. Machine a model of the written program.

NC/CNC PROGRAMMING

ART 234

COURSE OUTLINE:

I. Introduction:

a. Course Description
b. Course Objective
c. Performance Objectives
d. Course Outline
e. Course Requirements

1. Keeping a notebook
2. Use of library and reference material
3. Lab exercises
4. Written reports
5. Tests
6. Grades
7. Classroom policy

II. Numerical Control - History and Evolution:

a. General History of Numerical Control
b. Types of machines controlled by N/C
c. Accuracy, Repeatability, and Reliability

III. Numerical Control Programming:

a. Importance of Numerical Control
b. What N/C consists of
c. Advantage and disadvantage of N/C
d. Planning for the use of N/C
e. N/C Justification

IV. How NUmerical Control Operates:

a. What a machinist needs to know
b. What a programmer needs to know
c. What makes a good N/C programmer
d. How N/c collects information
e. Machine registers and Buffer storage
f. Axis Relationships - Readouts
g. Types of feedback systems
h. Types of numerical control systems

COURSE OUTLINE cont'd:

V. Rectangular Coordinates - Absolute and Incremental:

a. Cartesian coordinate system
b. Two-axis tape control
c. Z axis control
d. Four-and-five axis tape control
e. Incremental system
f. Absolute system
g. Zero shift system

VI. Tape Coding, Specifications and format:

a. Tape specifications and standards
b. Tape materials
c. Tape coding
d. Tape preparation equipment
e. Types of tape format

VII. Simple Part Programming - Conventions and examples:

a. Functions controlled by N/C
b. Simple programming examples

VIII. Other Functions Controlled By N/C:

a. Linear interpolation
b. Circular interpolation
c. Programmable Z depth
d. Tool length compensation
e R work plane
f. Random and sequential tooling
g. Adaptive control
h. Cutter diameter compensation

IX. Modern N/C Turning Centers and Programming:

a. N/C lathe axis
b. OD and ID operations
c. Feed rates
d. Spindle speeds
e. Format information
f. Operations performed
g. System subroutines

X. N/C Machining Centers and Programming

a. Types of tool changers
b. Tool storage capacities
c. Tool length storage/compensation
d. Work tables
e. Format information
f. Operations performed

COURSE OUTLINE cont'd

XI. Numerical Control Programming with Computers

a. Characteristics of Computers
b. N/C and computers
c. Computer languages available for N/C
d. APT General Processor
e. Postprocessor
f. Writing an APT Program
g. Hardware vs. Software
h. CNC vs. DNC

XII. Tooling for Numerical Control Machines

a. Tooling considerations
b. Cutting tools used on N/C equipment
c. Fixturing
d. Sound tooling practices

XIII. The Future of Numerical Control

a. Beyond the Processor language
b. Computer Aided Design
c. Computer Aided Manufacturing
d. Computer Aided Process Planning

N/C CNC PROGRAMMING
ART 234

Text: Fundamentals of Numerical Control
William W. Luggen
Delmar Publishing

References: Programming of Numerical Control Machines
Roberts/Prentice
McGraw-Hill Publishers

Tool and Manufacturing Engineers Handbook
Volume 1 Machining
Editors: Thomas J. Drozda, PE CMjgE
Charles Wick, CMfgE
Society of Manufacturing Engineers

Materials: Steel, Aluminum or Brass to suit the project choosen for your written program.

Supplies: Notebook, pen and pencil
Calculator and floppy disc.
Programming paper
1/8" graph paper

Grades: 100-90 = A 89-80 = B 79-70 = C Below 70 = F

Tests.....30%
Final.....30%
Lab.....30%
Report.....10%
100%

Attendance: Same as student catalogue
Total absence must not exceed two weeks of classes.

Make-up work granted by authority and must be completed within the time frame of related absence.

Classroom Policy:

Students must wear proper attire for classroom and lab environment. No hats, shorts, sandals or outside coats. SHIRTS OR TOPS MUST BE WORN.

NO SMOKING, DIPPING OR EATING IN CLASS OR LAB